APRIL, 1953

APPLIED HYDRAULICS

THE MAGAZINE OF FLUID POWER TRANSMISSION

INCLUDING AIR CONTROLS AND AIR CIRCUIT DESIGN; ELECTRICAL CONTROLS

AIR ACTUATED INTENSIFIER CIRCUIT . . . pg 57

PIPING AND MANIFOLD LAYOUT . . . . pg 60

ELECTRONIC INSTRUMENTATION . . . . . pg 63

PUMP DESIGN FOR CONTROLLED DELIVERY . pg 70

FLARELESS FITTINGS . . . . . pg 82

DEVELOPMENT OF CLUSTER FITTINGS . . . pg 90

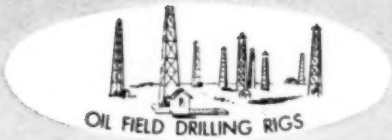
Listed on page 2 you'll find 11 articles and 7 regular departments which feature application and design ideas for fluid power equipment

AEROQUIP SELF-SEALING COUPLINGS

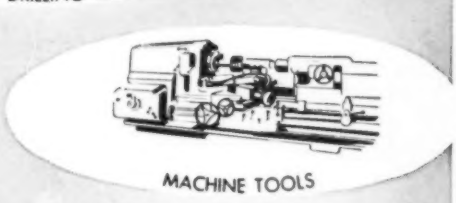
AND FLEXIBLE HOSE LINES

BUSES AND TRUCKS

RAILROADS



OIL FIELD DRILLING RIGS

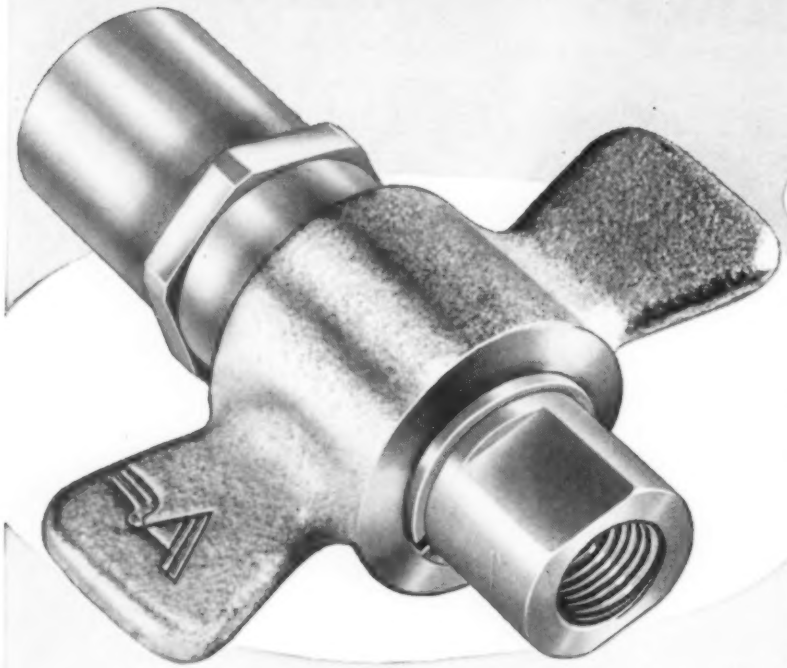


MACHINE TOOLS

MATERIALS HANDLING TRUCKS

Speed Maintenance

WHEREVER FLUID-CARRYING LINES MUST BE DISCONNECTED AND RECONNECTED



Speed **maintenance,** ***speed*** **repair operations and** ***speed*** **interchanging of accessories joined by fluid-carrying lines with Aeroquip Self-Sealing Couplings. Lines may be separated in a few seconds without loss of fluid. No air enters the system upon reconnection. There is no need to drain or prime the fluid system. One Self-Sealing Coupling takes the place of two shut-off valves.**

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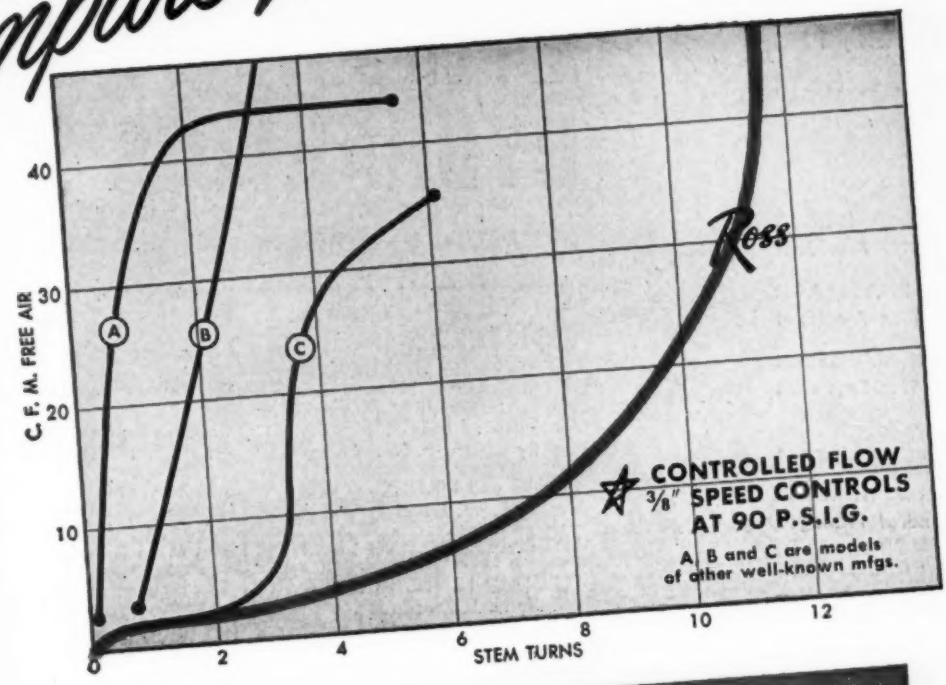

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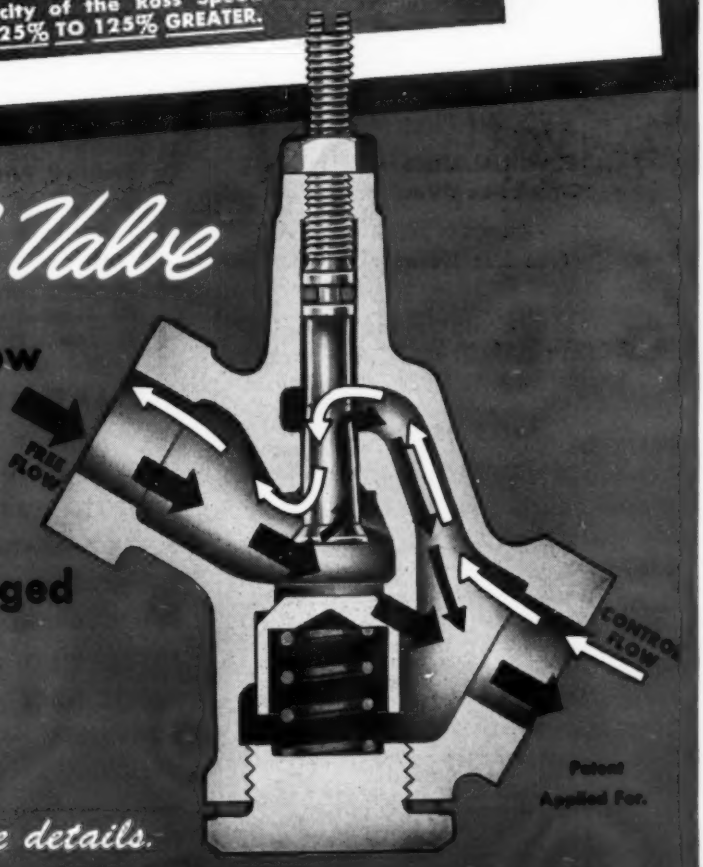
- ☆ Simple, dependable, rugged
- ☆ Small, lightweight



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APRIL, 1953
Vol. 6, No. 4

APPLIED HYDRAULICS

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Circle 78 on Reader Service Card →

MORGAN ENGINEERING APPLIES OILGEAR TO OPEN HEARTH CHARGING MACHINES

Gains Longer Life, Greater Visibility, Safety and Simplified Design

It has been said that for a number of years very few improvements have been made in open hearth charging machines used in steel mills. Here too a consideration of Oilgear Fluid Power equipment led to some valuable and important progress.

The Morgan Engineering Company, a leading manufacturer in the field, decided that much could be gained by the use of oil hydraulics and designed its 10-ton charging machine accordingly. Morgan uses the following Oilgear Fluid Power equipment: a hydraulic pump with a volume of 60 gallons per minute at 1700 psi pressure; 2 hydraulic cylinders for the hoist; one cylinder for the peel clamping device; two 4-way control valves located near the pump operated in turn by two pilot valves in the operator's cab; and a cam operated relief valve on the peel clamping device.

The company gained the following advantages: on the hoist, the conventional large hoist motor with its reduction unit is eliminated giving the operator maximum visibility and of course surer operation. The hydraulic cylinders used eliminate the conventional crank motion used hitherto exclusively.

The peel clamping device is actuated by one hydraulic cylinder, felt to be a definite improvement. It was found that hydraulic clamping is adequate by itself and the usual locking device was eliminated. More important, hydraulic clamping prevents oscillation of the boxes while the peel is being rotated and this prolongs the life of both peel head and boxes.

The cam operated relief valve is a safety measure, preventing the operator from lifting the box until the locking rod has been correctly located in the box head well.

Since this application has proved so satisfactory, the Morgan Engineering Company has applied Oilgear Fluid Power Equipment to other types of charging machines, to hot saws, inverted and portable strippers as well.

Designers should bear in mind the advantages cited above are in addition to the fundamental Oilgear advantages of flexibility, wide range of power, infinitely and steplessly variable speed range, unlimited ratios, smooth cushioned acceleration and shockfree hydro-dynamic braking, simplified and accessible hydraulic design well ahead of J.I.C. standards, a range of application from the handling of the most delicate and fragile webs up to the most massive power requirements. You are invited to submit your problem to Oilgear. It will cost you nothing to do so; it may prove to be one of the most profitable steps you have ever taken. THE OILGEAR COMPANY, 1564 W. Pierce St., Milwaukee 4, Wisconsin.

OILGEAR

OILGEAR

APPLIED HYDRAULICS

Fluid Power Lines

What's In Prize Papers?

Will it work? That's the first question which the judges will consider as they check the papers entered in the APPLIED HYDRAULICS Prize Paper Contest. There are $1500 in prizes being awarded for papers describing a design, an application or a maintenance procedure in the fluid power field. Some of the other points on which the judges will base their scoring will involve your approach toward reduced costs and improved production, the value to industry, and the originality of the subject.

You can get a complete set of suggestions for preparing your paper by writing us for your entry blank. The contest closes June 1st and prize money will be awarded in time to help out on your summer vacation.

Circuit Ideas

This month, over toward the back cover, you'll find a circuit sketch which is one solution to the recurring problem of synchronizing cylinders. We'll welcome your comments on this circuit or any suggestions and sketches of your ideas to solve this problem. If your sketching brings to mind other favorite circuits for solving shop problems send them to us.

Pump Design

Power steering on automobiles presents many interesting design problems including space, and efficiency, cost and maintenance. Each component must be tailor made. Because the pump is driven by the car engine, input speed is a variable and consequently delivery of a constant displacement pump will then vary. This varying volume with speed doesn't help the boys who are always aiming for higher efficiencies. One solution might be the ingenious little pump described in the article on page 70. As speed increases, piston stroke is shortened by an automatically increasing back pressure which opposes outward piston travel.

From Specific to General and Back . . .

One of the things which impresses us as we arrange trips to various plants and go through our daily correspondence is the many fields of application into which our interest in fluid power takes us. Each month in APPLIED HYDRAULICS articles, we take you along with us to see how several plants use air and hydraulics. It's up to us to show how fluid power used to solve some specific problem—let's say in the making of silverware—can be applied in your plant which may be making lamp shades. So we try to go from the specific to the general to help you relate some of the methods back to your specific problem.

You've probably learned that you can spark new ideas by visiting a plant which is making a product entirely different from yours. This visit can be more valuable than a tour through your competitor's plant. If you're making tubular electrical condensers, perhaps watching how shot gun shells are filled may present a new approach for your production.

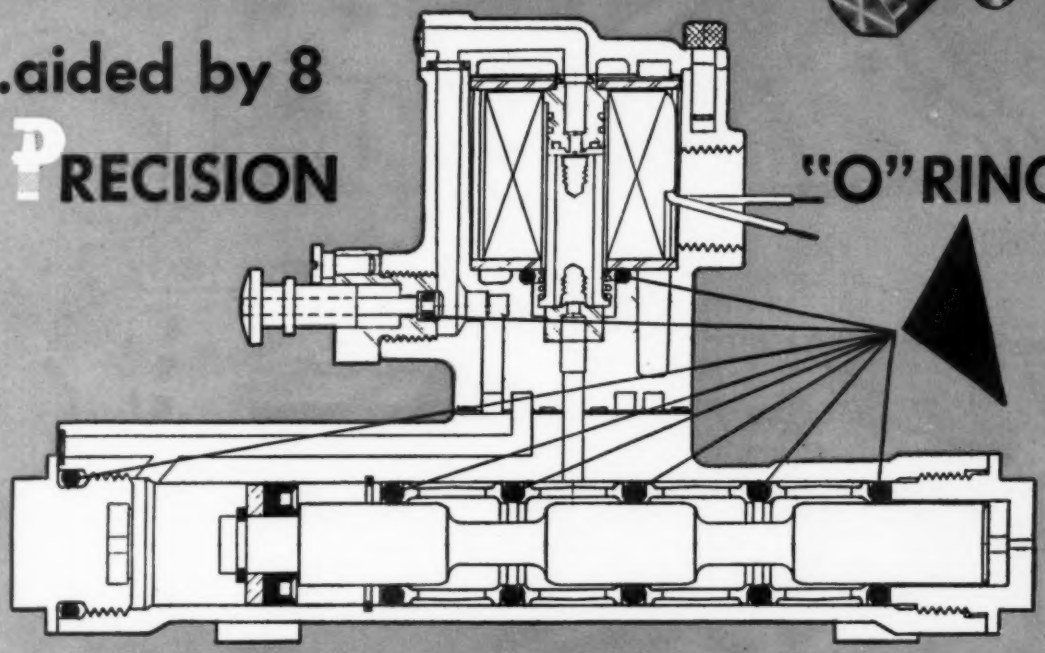
So, by way of articles, we'll take you with us to visit plants throughout the country which may be turning out arbor presses or zippers.

Instrumentation for Hydraulics

In this issue, Harley Kressin, who handles the preparation of instruments for some of the projects being carried out at The Franklin Institute in Philadelphia, has written the article on instrumentation for hydraulic systems. If your plant has or is establishing a lab where hydraulic systems or components are to be checked, you'll want to become familiar with the advantages of electronic instrumentation. Knowing what instruments are available, what they do and how they operate is the first step to running an efficient lab. From then on, it takes ingenuity and experience to apply the instruments and to find out what is happening in the oil circuit.

55 million cycles and this 4-way valve is still going strong!

..aided by 8 PRECISION "O" RINGS



This pilot-operated 4-way valve—developed by THE VALVAIR CORPORATION of Akron, Ohio—employs 8 *Precision* "O" Rings for leak-proof sealing under air, oil, water or inert gas pressure. Designed to give trouble-free performance for more than 50 million cycles of heavy-duty service, this compact valve requires "O" Rings of *highest quality*—and that is why *Precision* "O" Rings were chosen!

Everyone is finding *Precision* "O" Rings the best answer to many sealing problems—and they are finding, too, that *Precision* leads the field in engineering help and proper deliveries to keep production lines going. Let us work with you. Send for our "O" Ring Handbook and let us have your inquiries.

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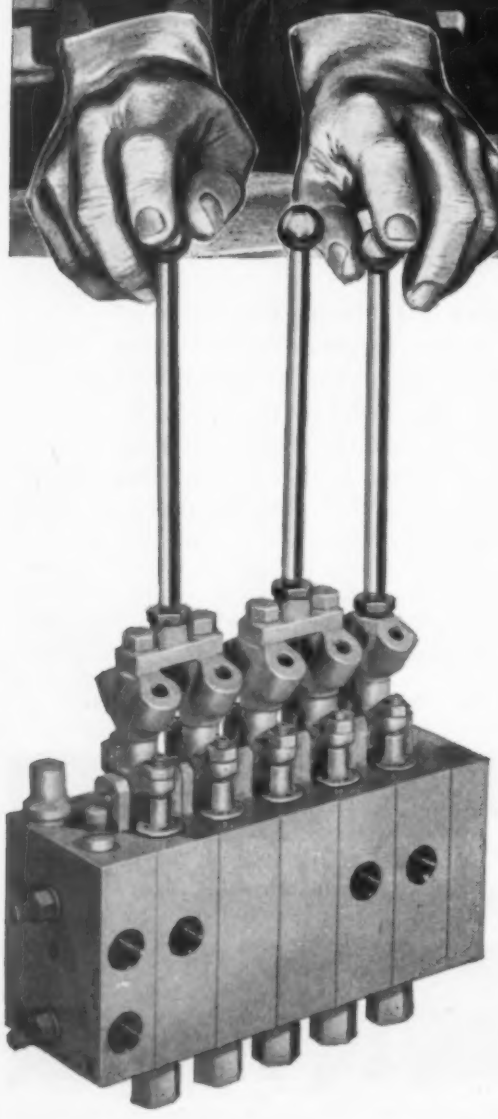
Our business i

ALL-HYDRAULIC TraveLoader

Latest advance in self-propelled, high-speed loader uses Blackhawk Hydraulics throughout. Three sizes of rams, V-28-3V VALVBANK and P-104 Pump provide adjustment of conveyor for varying truck heights . . . raising of front wheels for highway travel . . . lifting of feeder for cleaning and servicing.



For low-cost, positive-sealing control valves — standard VALVBANK sections can be combined in unlimited combinations

Blackhawk VALVBANKS are without comparison for controlling the flow of oil into single- or double-acting rams or any other hydraulic device requiring corresponding control. The V-28 valve (shown at left in a VALVBANK) is an open-center, series type, precision-control valve for all pressure ranges. Hydraulically balanced, it handles up to 6000 psi working pressures with finger-tip actuation. Flow capacity up to 6 gpm. VALVBANKS can be built up in any combination of single- and double-acting control units and include a relief valve. Spring-return to neutral "hold" position provides "dead-man control." All ports are ½" standard pipe thread.

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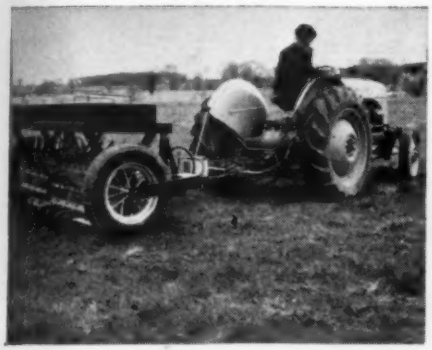
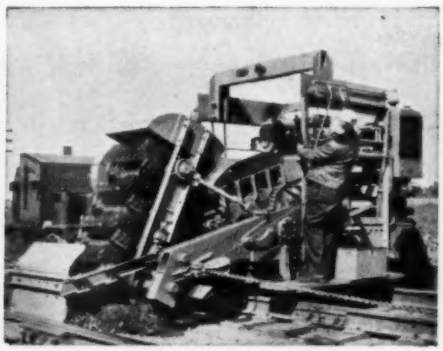
3. CUSTOMER SATISFACTION — Simplified construction has proved itself to be long-lived under the most grueling field conditions.

You are invited to take full advantage of Blackhawk's unmatched engineering and manufacturing facilities. Write for detailed engineering literature on the complete line of Blackhawk pumps, rams and valves for original equipment applications.



DIVOT DIGGER — Turf aerator loosens soil under grass cover without disturbing turf. Blackhawk hydraulic pump lifts and lowers the reel to clear obstacles.



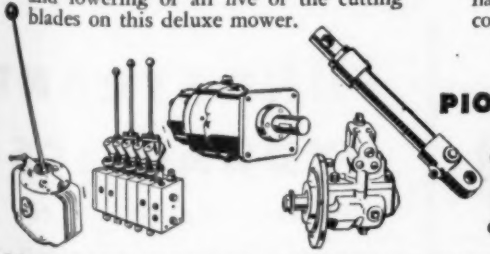
BALLAST WASTER — Fouled railroad ballast is removed from roadbed and wasted over the bank. Blackhawk pump and valve control chain propulsion mechanism.

POWER WHEELBARROW can also be equipped with a variety of front-end attachments like this fork-lift which uses Blackhawk hydraulics to lift 500 lbs.

TRACTOR-MOWER — Blackhawk pump, rams and valve provide positive raising and lowering of all five of the cutting blades on this deluxe mower.

SEEDLING PLANTER — Plow and disc assembly are raised and lowered by a Blackhawk ram and "Power-Packer,"® a self-contained pump, valve and reservoir unit.

SERVICE TRUCK — Blackhawk hydraulic hand-operated pump permits easy lifting of loads up to 6000 lbs. Hydraulic safety valve prevents dangerous overloads.



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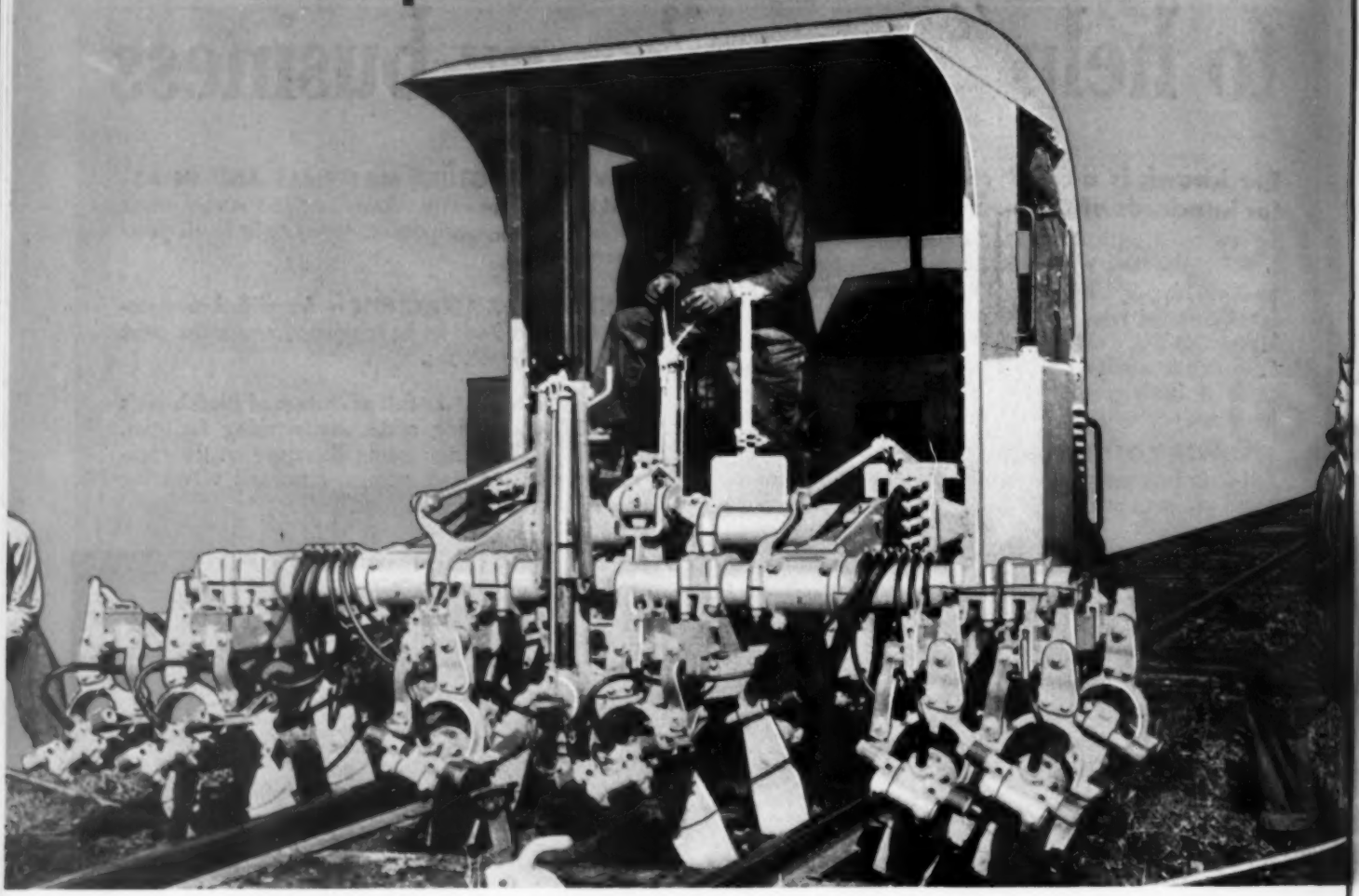
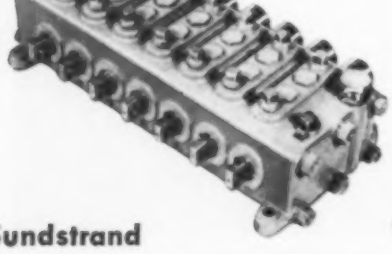


How Jackson "Multiple" tamps more track at less cost...



Sundstrand
Multiple Section Series Valve

...operates any number of cylinders or fluid motors *simultaneously* under full or varying load. Made in individual sections, with up to ten sections in a single centralized assembly. Check valves in each section assure positive control. Always maintains positive cylinder movement. Available in two sizes. Get Bulletin No. 3104.

Replacing the old hand-wheel type of indexing on Jackson Multiple Tampers is a new, built-in hydraulic system. Now the modernized machine moves faster, smoother, more efficiently in forward and reverse as the tamping blades consolidate ballast under the ties. The tamper speeds operations on "hot" track, builds up more miles of perfect track at lower cost, using less manpower, and with a minimum of operator fatigue.

Key to the improvement is a newly designed hydraulic system which permits fingertip operation . . . provides the exact degree of acceleration . . . gives fast, cushioned, positive braking action . . . and serves as a safety factor. For help on designing new hydraulic sales features into *your* equipment, with ease of control which appeals to operators, come to Sundstrand.

SUNDSTRAND

SUNDSTRAND HYDRAULICS

SUNDSTRAND MACHINE TOOL CO.
HYDRAULIC DIVISION, ROCKFORD, ILL.

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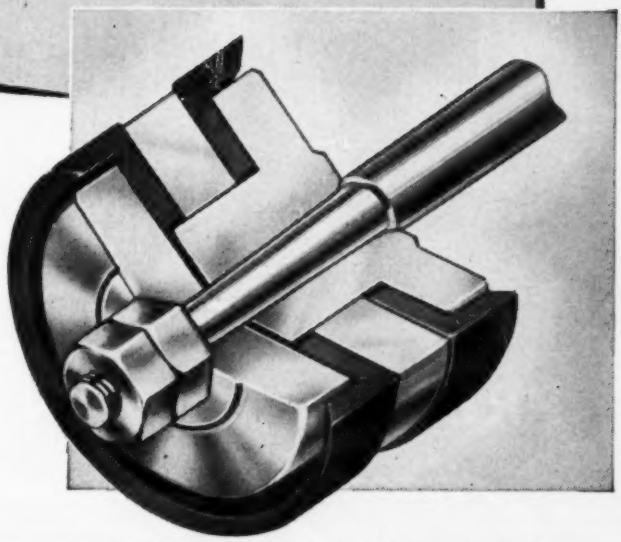
Save POWER...Save SPACE

Pack hydraulic cylinders with these Johns-Manville Custom-Moulded Packings



J-M MOULDED CUPS FOR PISTONS—

The power savings that generally result from the use of J-M Moulded Packing Cups are primarily due to the greater sealing efficiency provided by their pressure sensitive lips. The lips form a tight seal under discharge pressure, practically eliminating slippage past the piston. They relax on the non-working stroke, reducing wear and conserving power.

Precision-moulded for accurate fit, these J-M Packing Cups contribute to lower operating costs because of the improved performance of the equipment on which they are installed.

J-M Moulded Packing Cups are supplied in various types for installation on inside-packed pistons. They are furnished in a wide range of compositions of various compounds and fabrics to suit the pressures, temperatures and services encountered.

UNEEPAC FOR RODS AND PLUNGERS—

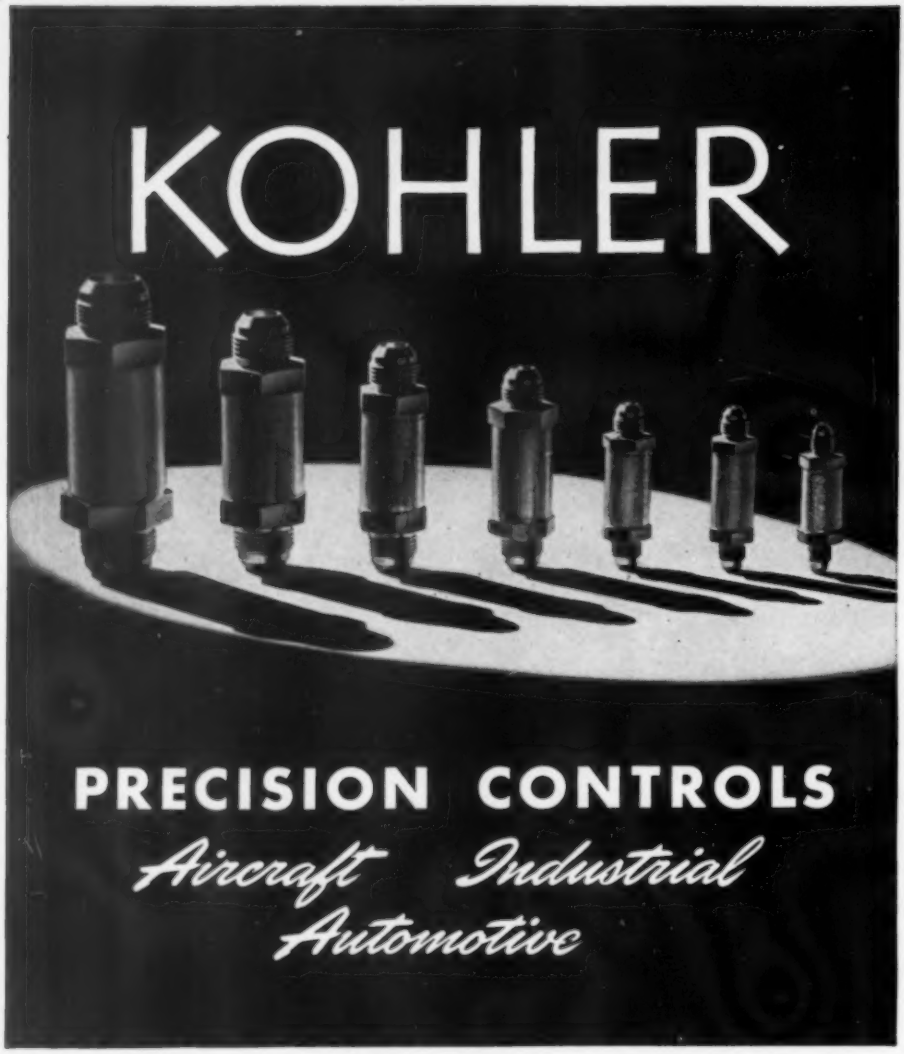
This new Johns-Manville automatic ring packing was developed to provide maximum sealing efficiency in minimum packing depth. Often used without header or follower rings, Uneepac is designed so that each sealing ring is a complete packing unit. Its pedestal center section protects the lips from damage by gland pressure . . . and positions them so that they are instantly responsive to fluid pressure changes. This construction results in efficient, automatic sealing, conserves power and reduces wear on rod and packing.

Uneepac is easily installed. Each ring seats itself on the preceding ring in the packing gland. Thus, the entire set is aligned concentrically and vertically—nesting perfectly. Uneepac is available for rod diameters from 5/8" up.

For more complete information about J-M Custom Moulded Packings for Hydraulic Cylinders, write Johns-Manville, Box 60, New York 16, N.Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville PACKINGS & GASKETS



Kohler hydraulic check valves used on many of the newer actuating systems. Their no-leak features will solve stringent installation requirements.

● From the valve that holds the fork of a lift tractor poised for unloading to a tiny fitting in the maze of a jet engine's fuel system, there's a Kohler precision control to suit a wide range of hydraulic, fuel, pneumatic, jet engine and airframe applications.

Facilities for forging, die casting, machining, anodizing, are maintained in one plant—with an experienced organization skilled in precision workmanship.

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PLUMBING FIXTURES • HEATING EQUIPMENT • ELECTRIC PLANTS
AIR-COOLED ENGINES • PRECISION CONTROLS

LETTERS to the Editor

Roller Operated Deceleration Valve

We are having difficulty in locating a manufacturer of a 1½ inch roller operated deceleration valve with a capacity of 90 gpm minimum. This valve is to be used on 1000 psi hydraulic oil service.

C. B. BLAKE
Engineering Dept.
Scovill Mfg. Co.

As you undoubtedly know, you are trying to put more than the recommended volume through a 1½ inch valve. Vickers, of course, make a 2 inch valve. Rivett Lathe and Grinder and Racine Hydraulics make a 1½ inch roller operated deceleration valve. However, it will handle only 70 gpm at recommended velocities. You did not give your operating conditions, so we don't know if you could use the Rivett valve. You would be inviting trouble to try to handle 90 gpm under all conditions in a 1½ inch valve.

"Noise in Hydraulic Pumps"

In your October issue a reference was made to a paper given at the National Conference on Industrial Hydraulics entitled "Noise in Hydraulic Pumps". Will you advise where a copy of this paper may be obtained.

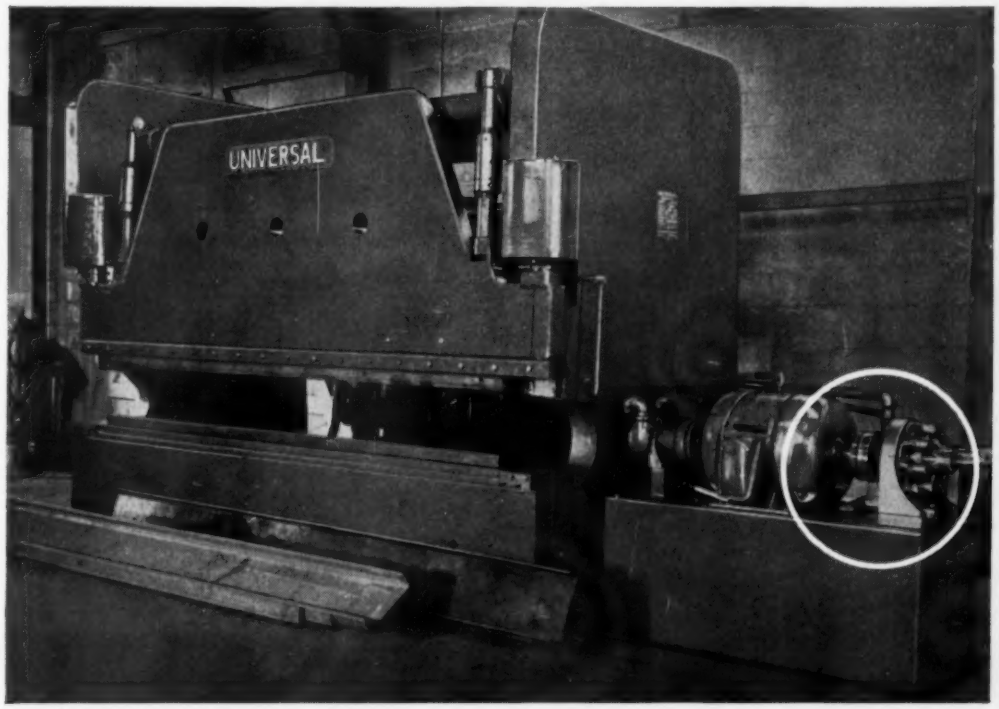
B. BECKER
Lewis-Shepard Co.

The paper, "Noise in Hydraulic Pumps" was delivered by Professor E. L. Midgette, Head, Department of Mechanical Engineering, Polytechnic Institute of Brooklyn, at the 1952 National Conference on Industrial Hydraulics. This paper, with all other papers delivered at the Conference, is published in the Proceedings of the Conference. Copies of the Proceedings may be obtained from John G. Duba, Conference Secretary, Illinois Institute of Technology, Technology Center, Chicago 16, Ill., at $4.50 per copy.

Transport Aircraft Hydraulic Conference

I have read and enjoyed your two brief reports on the transactions of the Second Transport Aircraft Hydraulic Conference. Can you tell me how I can obtain a more detailed transcript of the proceedings of the

WHEN IT'S HIGH PRESSURE IT'S **AMERICAN!**



Metallic sheets are "putty" to this machine...powered by a

HYDRAMITE

BENDING, FORMING, PIERCING, corrugating or braking sheets of metal up to ½ inch thick! That's the year in, year out job of the 10-foot, 300-ton Hydraulic Press Brake made by Universal Machine Company, Memphis, Tenn. And to assure economical, completely dependable power, Universal has adopted the AE Hydramite fluid power pump as standard equipment.

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variable pressures up to 3000 p.s.i.

Hele-Shaw is a radial-piston variable displacement fluid power generator. Pressure and reversal of flow are controlled directly at the pump. Discharge can be varied from zero to maximum . . . and reversed gradually or instantly. Suitable controls available. Capacities from 0.5 to 53 g.p.m. and up.

AMERICAN ENGINEERING COMPANY

PHILADELPHIA 25, PENNA.

AE Products are: Taylor and Perfect Spread Stokers, Marine Deck Auxiliaries, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers.

American Engineering Company
2530 Aramingo Avenue, Philadelphia 25, Pa.

Gentlemen: Kindly send me complete information about the
☐ Hydramite. ☐ Hele-Shaw Pump.

Name.....Title.....
Company.....
Address.....
City.....Zone.....State.....

Tannate®
LEATHER PACKINGS

are Accurately Finished

Consequently, they fit snugly against shafts and cylinder walls—providing an effective, long-lasting seal against a variety of conditions. But accuracy of finish is only one quality responsible for the enviable success of Tannate packings. To meet your exact requirements, Tannate leather packings are "custom-engineered" from choice raw hides. These hides are treated with Rhoads special and exclusive tanning processes, producing an unequalled combination of desirable characteristics. Impregnation, too, is another "custom-line" operation. Another reason why Tannate Packings seal better . . . last longer.

You get these advantages in Tannate Leather Packings: They have a low coefficient of friction; do not cold flow; will not score or abrade. They do not require lubrication, and they can be stored indefinitely without loss of tensile strength. Tannate packings are "custom-manufactured" to operate efficiently over a wide range of pressures and temperatures—from sub-zero to over 200° F.—and with different types of mediums.

Send us your packing requirements for quotation. Include type, service, pressure, temperature, dimensions and quantity. There's no obligation. Do it today.

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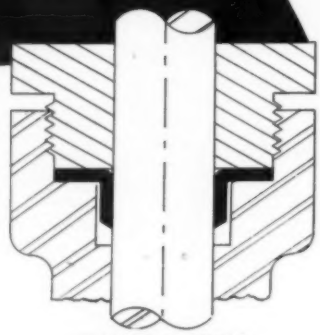
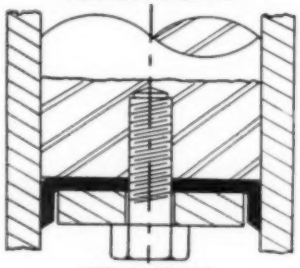
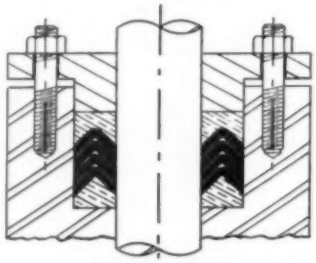
J. E. RHOADS & SONS
35 N. Sixth St., Philadelphia 6, Pa.



FLANGE PACKING



CUP PACKING



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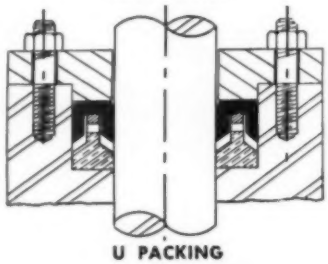

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Send for the Rhoads Packing Data File. No obligation.

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Letters to the Editor

Continued

conference. Also, where and when the next of these meetings will be held.

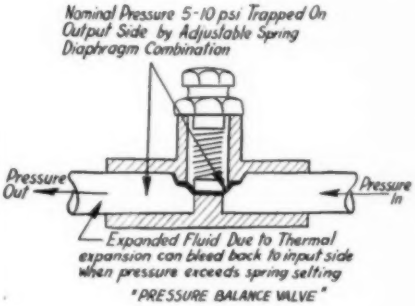
C. M. BLACKBURN
Applied Physics Laboratory
The Johns Hopkins University

The Second Transport Aircraft Hydraulic Conference was sponsored by Vickers, Inc., and two annual meetings have been held in Detroit each of the last two falls. Mr. W. L. Flinn of Vickers, Inc., 1474 Oakman Blvd., Detroit 32, Mich., will be able to give you information regarding the complete transcript of the Second meeting as well as the scheduling of the next meeting of this group.

Pressure Balance Valve for a Brake System

I would greatly appreciate any information you may be able to give as to a source for a "pressure balance" valve for a brake system. The function of this valve is to trap some fluid at the output side of the line, at some small nominal pressure when the pressure on the input side of the line is zero. A diagrammatic sketch of the valve is shown below.

LAWRENCE I. CHASEN
Engineering Division
Piasecki Helicopter Corp.


Nominal Pressure 5-10 psi Trapped On Output Side by Adjustable Spring Diaphragm Combination
Pressure Out
Pressure In
Expanded Fluid Due to Thermal expansion can bleed back to input side when pressure exceeds spring setting
"PRESSURE BALANCE VALVE"

We can suggest two possible sources for a pressure balance valve of the type you require: Hammel-Dahl Company, 175 Post Road, Providence 5, R.I. and Automatic Switch Company, 385-H Lakeside Ave., Orange, N.J. make a diaphragm shut off valve that might be adapted for your purpose. Editor's Note: Readers who know of other valves that might be used, please write Mr. Chasen direct.

Hydraulic Motor for Winder Unit

On page 35 of your January issue you state that on the slitter line at the Scovill works, the winder unit is driven by a hydraulic motor to provide constant pull throughout the coil

Continued on page 16

Why DESIGN ENGINEERS have proved and approved

AJAX

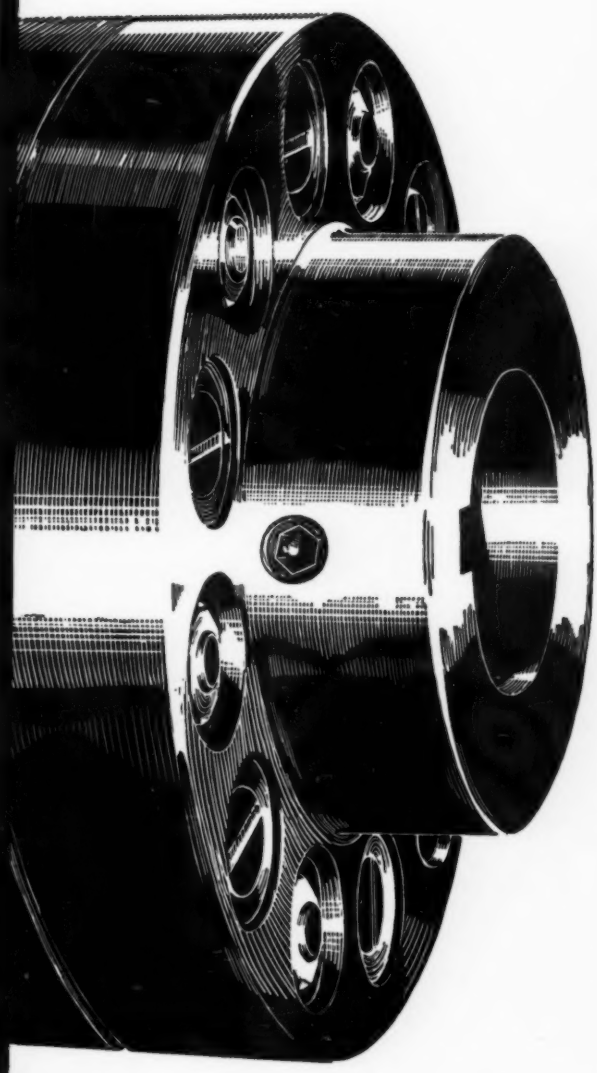
AS AMERICA'S STANDARD RUBBER BUSHED FLEXIBLE COUPLING

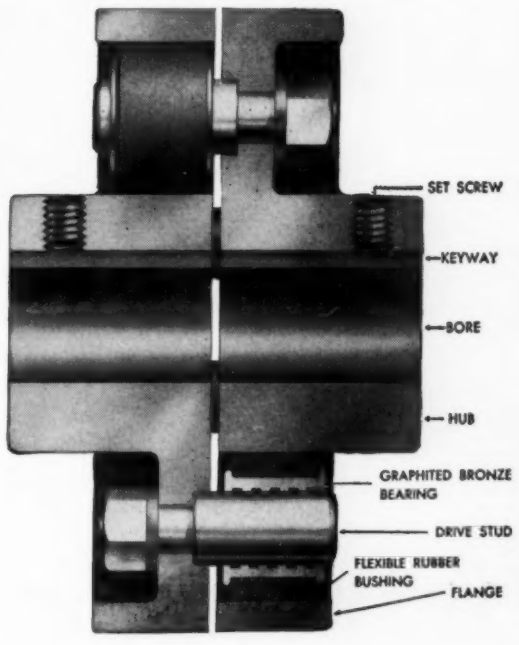
● With clearances in modern machines measured in thousandths, not fractions, protection against major damage due to unavoidable mis-alignment is an essential safeguard to expensive working parts.

The positive, resilient drive provided by Ajax Flexible Couplings has proved to be good economy for manufacturers of good machinery over a period of 30 years. Ajax Rubber Bushed Flexible Couplings permit each shaft to rotate around its own axis without creating vibration, backlash, chatter, strain on bearings, power loss, reversal of torque or other detrimental factors entering into the direct connection of power.

The cross-section view shows how Ajax Rubber Bushed Bronze Bearings and hardened and ground steel studs provide flexible yet positive drive.

Standard Ajax Couplings are made of forged steel or cast semi-steel. Aluminum, bronze and other metals available for special applications. Made in a wide range of sizes and capacities.





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AJAX FLEXIBLE COUPLING CO. INC.

10 English St., Westfield, N. Y.

Series M2-300 Vickers Hydraulic Motors made in three sizes with 3 styles of mountings.

Series M2-200 Vickers Hydraulic Motors made in two sizes with 2 styles of mountings.

NOW AVAILABLE-

Series M2-400 Vickers Hydraulic Motors made in two sizes with 3 styles of mountings.

MORE SIZES of VICKERS BALANCED VANE TYPE HYDRAULIC MOTORS

Series M2-500 Vickers Hydraulic Motors made in two sizes with 2 styles of mountings.

Now in production are two more series of Vickers Balanced Vane Type Hydraulic Motors. They are now available in nine sizes and have normal horsepower ratings to 28.5 hp. Among the important features of these simple and rugged hydraulic motors are: (1) more horsepower for less money, (2) hydraulic balance for longer life and less maintenance, (3) automatic wear compensation, (4) dynamic balance and quiet operation, (5) exclusive "rocking beam" construction. Get in touch with your nearest Vickers Application Engineering office for further information; ask for new Bulletin M-5103.

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Application Engineering Offices: **ATLANTA • CHICAGO (Metropolitan) CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES (Metropolitan) • NEW YORK (Metropolitan) • PHILADELPHIA (Metropolitan) PITTSBURGH • ROCHESTER • ROCKFORD • SEATTLE • TULSA WASHINGTON • WORCESTER**

Write for NEW Bulletin M-5103

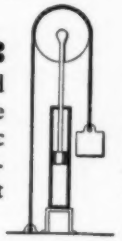
6219

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

got a TENSION LINKAGE problem?

If you design hoists, lift trucks, counterweight suspensions, controls or any type of equipment where you must transmit pull or lift something, Baldwin-Rex® Roller Chain, Leaf Chain or Block Chain is likely to be the answer to your linkage problem.

here's a good example:

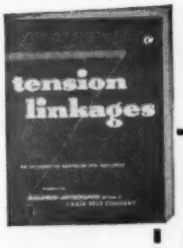


Increase of travel distance on a hydraulic lift. The chain, fixed at one end, passes over the sprocket, and is attached to the lift platform. The sprocket shaft is carried on the hydraulic plunger rod. In the arrangement illustrated, vertical movement of the platform is twice that of the plunger. Movement is frequent and shock loads are severe, so *chain* is the answer. If the lift is mounted on a truck, severe shock and fatigue stresses are imposed on the chain as the truck moves.

here's another one:

Transmission from a double-acting hydraulic cylinder to a shaft. Since motion must be transmitted in two directions, an idler sprocket is required as shown in the illustration. Since operation may be practically continuous, and shock effects are probable, *chain* is the answer. When this type of installation is applied to rudder control, shock and fatigue considerations are especially important.

our Tension Linkage bulletin



Covers typical examples of tension linkage applications . . . helpful step-by-step data on equipment selection and examples to guide you in making your selections. There are tables of dimensional data and other important facts you'll find useful in your work. Send for your free copy today. Just fill in and mail the coupon below. There is no obligation.

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A PRODUCT OF
Chain Belt COMPANY
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BALDWIN-DUCKWORTH 52-402
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Send me my copy of Bulletin No. 51-10 covering Tension Linkages.

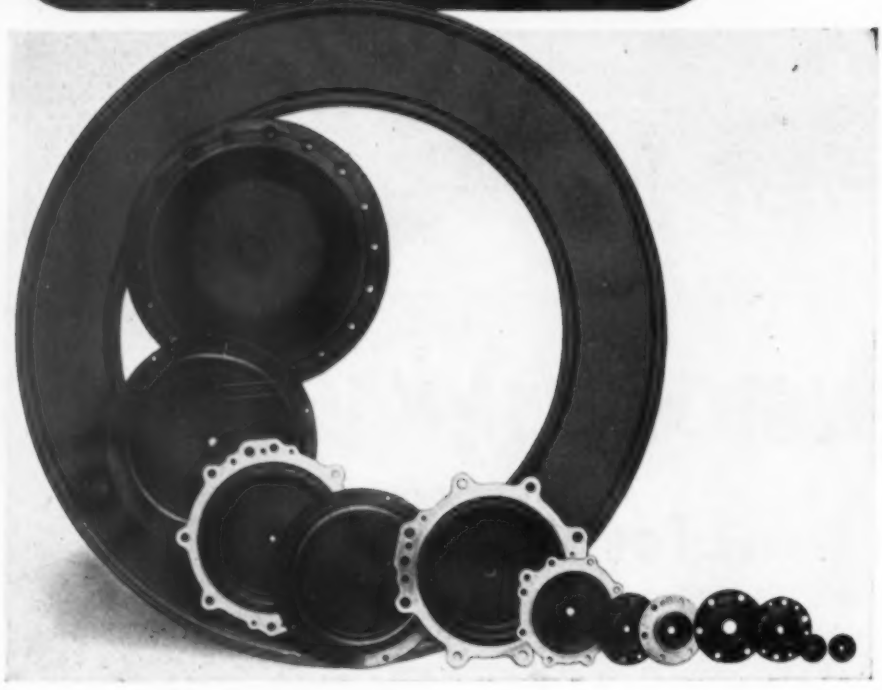
Name.....

Company..... *Dept*.....

Address.....

City..... *State*.....

DIAPHRAGMS



FOR ALL INDUSTRIAL APPLICATIONS

One of Acushnet's many specializations is in the field of diaphragms. We have achieved notable success in the design, development and molding of all types of diaphragms, with or without fabric inserts, from the size of a dime up to three feet in diameter.

Special stocks are expertly compounded with properties to resist various fluids and gases, extreme high or low temperatures, or combinations of these requirements. We are fully equipped to produce rubber diaphragms bonded to metal. Problems involving the most meticulous specifications are invited.

Acushnet
PROCESS COMPANY

Send for a copy of the "Acushnet Rubber Handbook", a comprehensive rubber data reference for molded rubber parts.

Address all communications to 794 Belleville Ave., New Bedford, Mass.

Letters to the Editor

Continued

build-up. We would be interested in knowing who supplied the hydraulic equipment for this particular drive.

John W. Korcz
Technical Advisor
Aluminum Rolling Mills Ltd.

The hydraulic motor driving the winder unit on the slitter line shown on page 35 in the January Directory issue of APPLIED HYDRAULICS was furnished by Vickers, Inc.

J.I.C. Hydraulic Standards

We would be interested in learning where we can obtain a copy of the J.I.C. Hydraulic Standards and also a schedule of future conference meetings.

J. S. McAvoy
Project Engineer
Engineering Department
Dowty Equipment of Canada, Ltd.

We are sending you a copy of the J.I.C. Hydraulic Standards for Industrial Equipment. As reported in APPLIED HYDRAULICS last issue, a three day meeting was held on January 21, 22 and 23, at which time the entire standards were reviewed and a number of changes were made. It is our understanding that a revised Hydraulic Standards will shortly be published that will incorporate all the changes suggested and accepted at the above meeting. Copies of the revised Hydraulic Standards may be obtained by writing to Joint Industry Conference, Box 182, North End Station, Detroit 2, Mich. General meetings are always open to members of industry who are interested. As far as we know no additional meetings are now scheduled. However, we suggest that you write to Robert Mitchell, Secretary, J.I.C., Product Engineering Section, General Motors Corporation, 15-228 General Motors Bldg., Detroit 2, Mich., so that you will be advised of future meetings.

High Pressure Air Valves

We need components for controlling air at 1500 psi in various sizes to three inch pipe. Can you suggest any source for obtaining these?

G. H. Elder, Jr.
Van Zelm Associates

The Cornelius Company, 550 39th Ave., Minneapolis 21, Minn., and Walter Kidde & Company, Inc. 669 Main St., Belleville 9, N.J. make high pressure air valves but larger sizes would be special. The W. H. Nicholson company offer high pressure valves up to 2 inches but these are heavy industrial type valves. We sug-

PUMPS

for FLUID POWER

The most comprehensive range of types, capacities and pressures for industrial, machine tool, materials handling, mining, oil well and aviation applications. Also hydraulic motors, cylinders and valves to develop complete hydraulic circuits.

for HANDLING LIQUIDS

An exceptionally broad range of types, sizes and special constructions to handle virtually "any substance that will flow through a pipe" including: syrups, acids, sludges, slurries, asphalt, bunker fuel, etc. There are deep and shallow well Centrifugal and Turbine types, Rotating Plunger and Herringbone Gear Pumps.

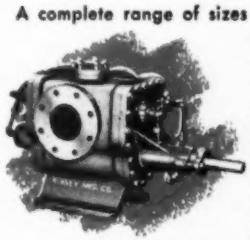
for VACUUM PROCESSING

High vacuum pumps for laboratory, electronic, atomic research, biological and other chemical processing, vacuum refining of metals, de-aerating, dehydration, vacuum drying, refrigeration, etc.

HYDRECO GEAR TYPE PUMPS

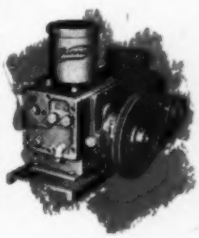
Reversible and non-reversible. Gear type pumps in exclusive FOUR-BOLT design . . . capacities from .5 to 130 gpm and operating pressures to 1500 psi . . . flange or foot mounted . . . furnished with keyed shaft with spline shafts optional. Also dual and tandem models.

KINNEY LIQUID HANDLING PUMPS



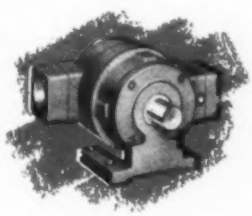
A complete range of sizes in Rotating Plunger and Herringbone Gear Pumps to handle light or heavy liquids, sludges, slurries or viscous substances. Available in plain or steam jacketed models and built of special corrosion resistant metals where desired.

KINNEY VACUUM PUMPS



Single stage models to produce absolute pressure readings of 10 microns (.01 mm Hg.) . . . compound pumps producing readings of .2 microns (.0002 mm Hg.) or better. These Kinney High Vacuum Pumps are available in sizes for laboratory as well as high production use.

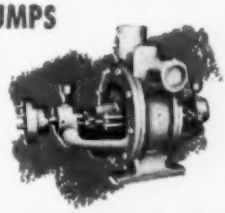
DUDCO DUAL VANE TYPE PUMPS



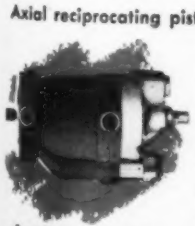
DUDCO Pumps provide a broad range of sizes with capacities to 120 gpm and pressures to 2000 psi. Also available in multiple units operating from a single drive. Hydraulic motors with starting torque outputs to 14,000 lb. in. at 2000 psi.

AURORA CENTRIFUGAL & TURBINE PUMPS

Deep well, sump, drainage and condensation return units, household water systems. Industrial low and high pressure liquid handling pumps. Direct motor and countershaft driven horizontal and vertical models. Capacities 3 to 7500 gpm.



STRATOPOWER PISTON TYPE PUMPS



Axial reciprocating piston type . . . constant or variable delivery with capacities of .25 to 10 gpm at nominal speeds of 1500 rmp with maximum of 4500 rmp . . . working pressures to 3000 psi . . . direct engine and individual electric motor driven models.

THE NEW YORK AIR BRAKE COMPANY

230 PARK AVENUE • NEW YORK 17, N. Y.

Write—

For detailed information on the type of pump in which you are interested.

THE NEW YORK AIR BRAKE COMPANY
230 Park Ave., Dept. AH, New York 17, N. Y.

Gentlemen: Kindly send additional information on the pumps I have checked.

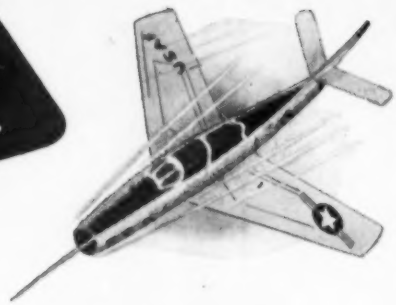
- ☐ Hydreco Pumps
- ☐ Kinney Liquid Handling Pumps
- ☐ Stratopower Pumps
- ☐ Kinney Vacuum Pumps
- ☐ Dudco Pumps
- ☐ Aurora Pumps

Name .....

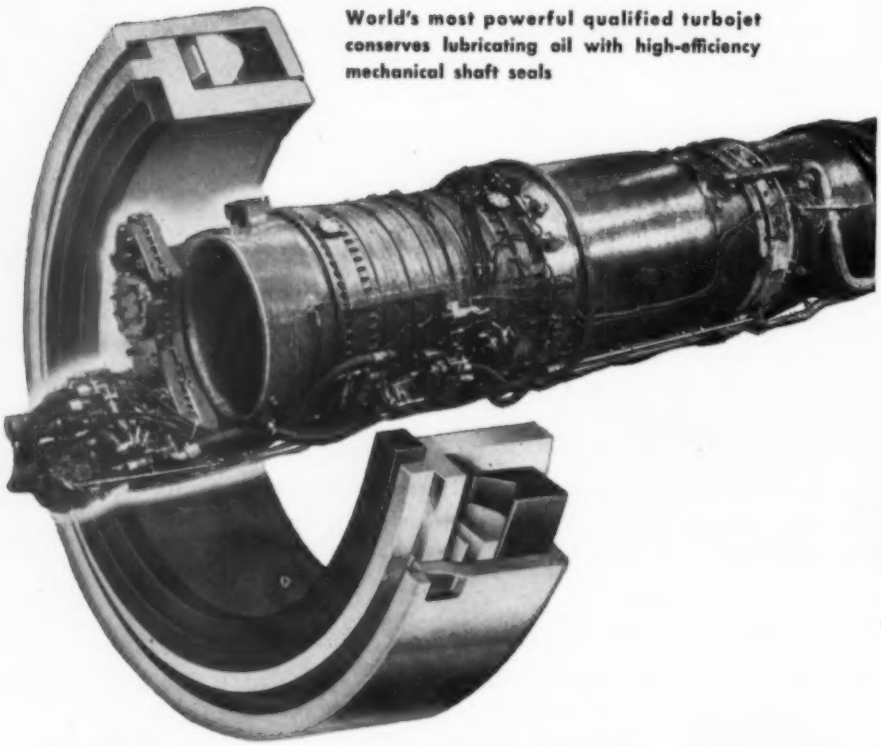
Address .....

City ..... State .....

SEALOL SERVES THE JETS . . .



World's most powerful qualified turbojet conserves lubricating oil with high-efficiency mechanical shaft seals



It's the Westinghouse J40 turbojet aircraft engine — capable of developing thrusts equivalent to approximately 25,000 HP at today's jet flight speeds. Among its many performance "firsts", this engine has established an outstanding record in conservation of lubricating oil — actually cutting allowed oil consumption by 93%.

Sealol is proud that Westinghouse Electric Corporation incorporated Sealol Seals into this powerful turbojet engine which drives the McDonnell F3H "DEMON" and the Douglas F4D "SKYRAY" among others.

Sealol has specialized in the design and manufacture of seals for unusually rigorous operating conditions. These include processing tank agitator shafts, high pressure hydraulic pumps, process pumps in chemical and refining industry, centrifugal compressors and blowers, etc.

If you have a shaft-sealing problem, consult Sealol. Send blueprints and specifications to our engineering department — Sealol Corporation, 45 Willard Ave., Providence 5, R. I.

CHICAGO • CLEVELAND • LOS ANGELES • PHILADELPHIA
(In Canada: Lyman Tube and Bearings, Ltd., Montreal, Toronto, Winnipeg)

SEALOL

The Balanced Pressure Seal

Letters to the Editor

Continued

gest you use the industrial and aviation air valve lists in the 1953 *Directory (January issue) to write manufacturers describing your requirements.*

Extra Copies of APPLIED HYDRAULICS

We have extra copies of the February, 1953; November, October and June, 1952 issues on hand. Readers who wish extra copies are invited to write the Production Department. Normally, we cannot supply extra copies of back issues, particularly those more than six months old.

Throatless Press Design

I read the story in your March issue on the 75,000 ton throatless press that used a monolithic concrete structure to replace the tie rods. Have any presses of this type been built and by whom?

J. K. L.

Fortunately, we have some notes prepared by A. Zeitlin of Hydropress, Inc. which permits us to give you a very adequate answer. In 1939 *a* 30,000 *metric ton* (33,000 *U. S. tons*) *was designed utilizing plain or prestressed concrete as a structural element by the Lowey-Hydropress group working with the French light-metals industry. The press was not built because the claims regarding alleged technical advantages, as well as economy of construction, did not stand up under close check-up. The detailed analysis made at the time of design disclosed that the steel platens and the steel crosshead had to be retained in the concrete design in order to keep the rigidity of the press within the limits required by the accuracy of the work to be performed. As a result, the only steel elements of the press structure eliminated by the use of concrete are the columns; the analysis also showed that the steel required for reinforcements will weigh twice as much as the steel saved in the columns.*

The accessibility of the "open" design of the press was rather disappointing when closely reviewed, because the "open" design required a very sturdy leader-pin arrangement for the die set. The leader-pins, ordinarily arranged behind columns, became visible and quite objectionable once the columns were eliminated. It was also determined that

Continued on page 20

Circle 101 on Reader Service Card

Circle 57 on Reader Service Card

F

For Efficient Power Transmission

The "CARLISLE" GRADER
KEELAVITE HYDRAULICS GIVE EFFICIENT TROUBLE-FREE CONTROL
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Keelavite hydraulics

THE RECOGNISED AUTHORITY ON HYDRAULIC POWER TRANSMISSION

KEELAVITE ROTARY PUMPS & MOTORS LTD. COVENTRY

Sales Representatives for Canada, Genaire Limited, P.O. Box 84, Municipal Airport, St. Catherines, Ontario.

What's your problem in power motion?

There's an Anker-Holth cylinder to solve it!

● Advanced designs of Anker-Holth power cylinders in a wide range of sizes and types are available to solve your problems involving push, pull, lift or lowering action. If standard cylinders aren't the answer, Anker-Holth matches your needs with special designs.

For help in engineered cylinder power . . . air or hydraulic . . . write Anker-Holth Division of The Wellman Engineering Company, Dept. C-3, 2723 Conner St., Port Huron, Michigan.

FREE on request . . . bulletin on complete line of Anker-Holth products.

Anker-Holth
ENGINEERED CYLINDER POWER
WELLMAN
Division of THE WELLMAN ENGINEERING COMPANY

Letters to the Editor

Continued

the cost of a concrete structure was rather substantially more than a press utilizing steel throughout. These conclusions were reported to the Munitions Board and to the industry by Erwin Loewy, President of Hydropress, Inc. on February 20, 1950.

It was the concensus of opinion of all concerned with the 1939 project that the use of a building structure, supplemented by additional quantities of concrete as a substitute for press columns, was uneconomical for presses of less than 150,000 tons capacity. Estimates prepared by the Lowey Construction Co., Inc., over the period of the last two years seem to indicate that this opinion is still correct.

Rate Accumulators in Gallons

We note a misprint on page 46 of the February issue of APPLIED HYDRAULICS which we would like to bring to your attention. The last line on the page which reads "select a 5 gpm accumulator" should read "select a five gallon accumulator."

JULIUS KENDALL
VP Sales
Greer Hydraulics, Inc.

Thank you Mr. Kendall. This slipped by us.

Low Leakage High Pressure Air Valves

Would you let us know if you can tell us of a manufacturer who can offer or is working on designs of a high pressure valve for 6000 psi air with a leakage rate not to exceed 3 cubic feet per minute.

J. H. MILLAR
President
Engineering Developments, Inc.

We do not of anyone who is working on designs for a high pressure valve for 6000 psi air with a leakage rate not to exceed 3 cfm. Perhaps, one of our readers know of work being done at this range.

Ditching Machine

Your cooperation will be appreciated in advising the writer the name of the manufacturer of the ditching machine illustrated on page 57 of the January Directory issue of APPLIED HYDRAULICS.

CHARLES W. HEADDEN
Manufacturers Agent
Washington, D. C.

The ditching machine shown on page 57 of the January issue was

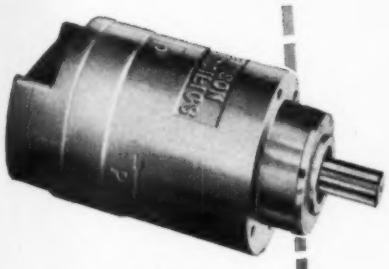
Continued on page 24

DENISON HydrOILics

. . . for longer-lasting efficiency

PUMPS, MOTORS and CONTROLS

"The Finest Money Can Buy!"



Denison Axial Piston Pumps.
Hydraulically balanced, high-pressure, high-volume pumps in a range of sizes for circuits of 3000 and 5000 psi capacity . . . volume capacities 3.5 to 35 gpm. Constant volume, or variable volume with control by hand wheel, pressure compensation, stem, or cylinder. Face, flange or foot mountings. Catalogs P-4-1, P-4-2, P-4-3, P-4-10.

Multi-Range Flow Controls
permit full-scale regulation of flow for many different circuit needs, at pressures to 3000 psi. Infinitely adjustable within each range of control . . . cartridge-type single-spool design adjusts easily to various pump deliveries without changing spools. 2-port and 3-port types, with or without built-in check. ¼", ⅜" and ¾" sizes; 0 to 28 gpm capacities.

Pilot-Operated 4-Way Valves
—with solenoid control—for circuit pressures to 5000 psi. Eliminate spool-sticking during long high-pressure holding cycles. System pressure shifts valve spool; solenoid operates valving only. Catalog VD-1-1.

For more than 25 years, Denison has been meeting Industry's toughest demands for oil-hydraulic equipment—with efficient high-pressure components that have won wide approval for their rugged, compact design and long, low-cost performance.

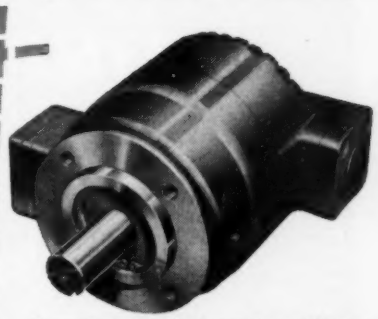
To meet constantly increasing needs, Denison now offers *today's most rapidly expanding line* of equipment for packaged hydraulic power, hydraulic transmissions, remotely controlled equipment, and other requirements for widely adjustable power, speed and control. A few of these HydrOILic components are shown here.

To make sure you get the fullest advantages of oil hydraulics—for variable-speed drives, accurate pressure control, spark-free power transmission, or closely controlled motion of any kind—specify Denison's HydrOILic Equipment.

Write for further details or call your Denison representative today.

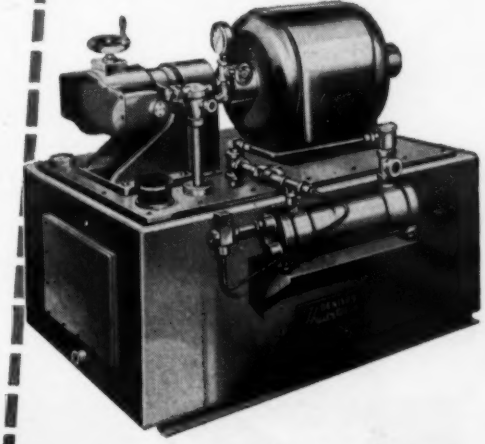
The DENISON Engineering Co.
1166 Dublin Rd., Columbus 16, Ohio

DENISON HydrOILics



Vane-Type Single-Stage Pump/Motors,
built for continuous use at pressures to 2000 psi, are ready for either pump or fluid motor duty without alterations. Rotation of shaft can be either direction without internal adjustment. Four sizes, plus interchangeable cam rings, offer pumping capacities from 2½ to 70 gpm, or torque ratings from 13 to 257 inch-pounds per 100 psi. Catalog P-5.

Denison Axial Piston Fluid Motors.
Four sizes, with torque capacities ranging from 510 to 5585 inch-pounds (about 24 to 160 HP). Speeds to 2000 and 3000 rpm. Compactly built . . . largest size is only about one foot in diameter. For circuits of 2500 and 5000 psi. Catalogs FM-2 and FM-3.



Denison's Self-Contained Pumping Units.
37 models cover any circuit need from 400 to 5000 psi and from 2 to 35 gpm requirements. Automatic water-cooled oil coolers or two-pass automatic heat exchangers available for extra heavy or continuous service. All operating components mounted on reservoir top in single-panel assembly, for easy removal as a unit. Catalogs PU3 and PU4.

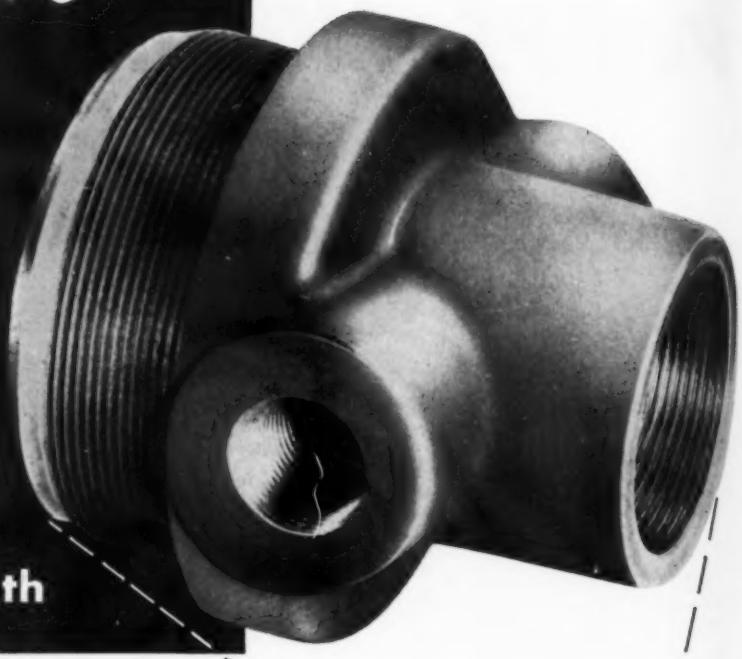
Circle 31 on Reader Service Card

Pathon

HYDRAULIC CYLINDER

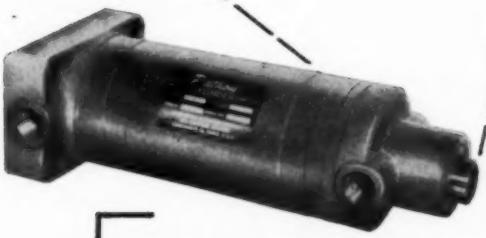
RH Series 2000 P. S. I.

heads are retained by a single screw thread for maximum strength



You get

- Low stress concentration
- Greater resistance to fatigue and shock loading
- Rotatable pipe ports and mounting pads
- Compactness difficult to obtain in any other type of construction



In choosing Hydraulic Cylinders what are you looking for? *Compactness? Adaptability? Greater efficiency in operation?* You're sure of all three when you specify Pathon Series RH 2000 P.S.I. Hydraulic Cylinders.
Write us today for our catalog. Let us show you why Pathon is rapidly becoming the leader in its field.

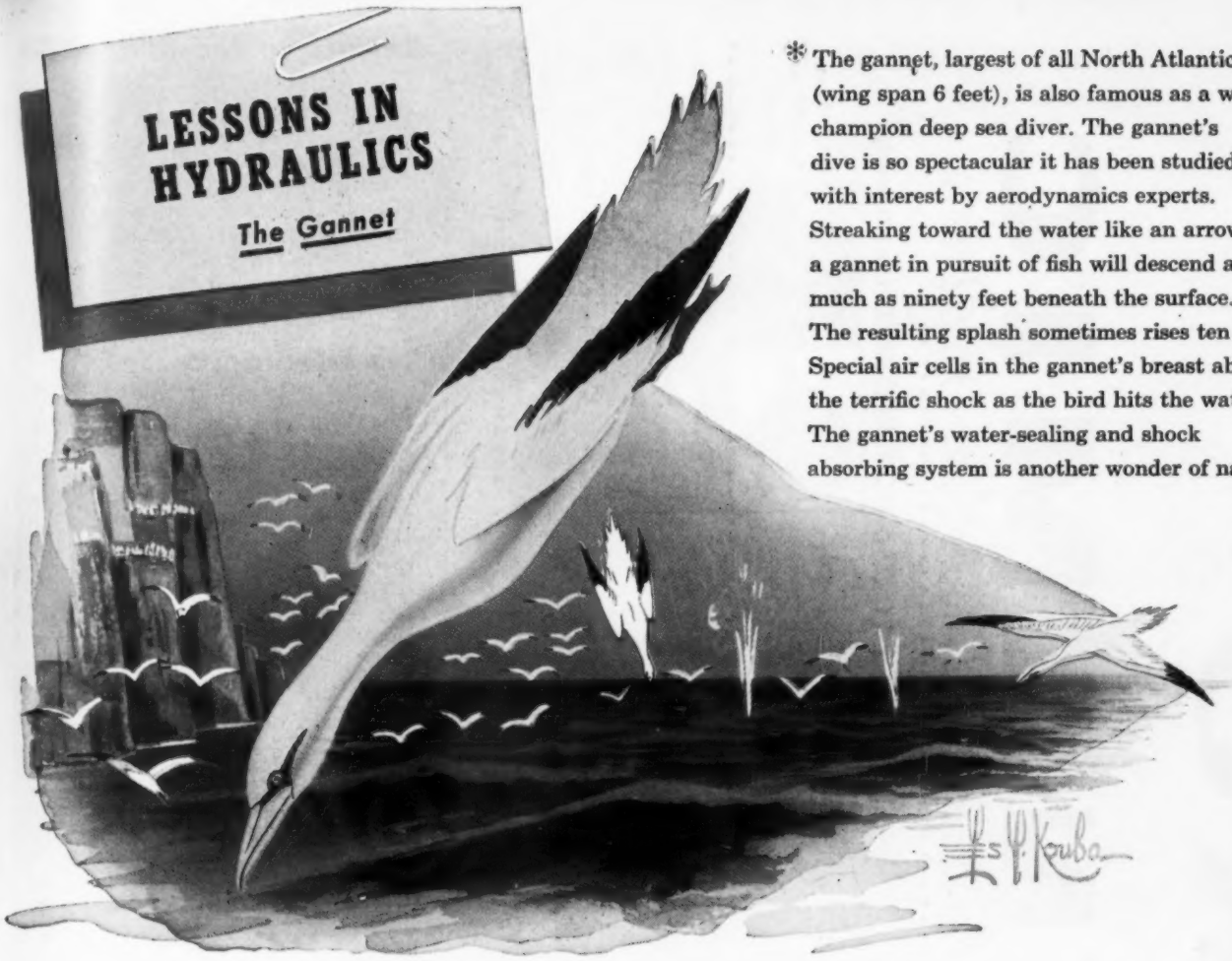
Pathon
AIR CYLINDERS

HYDRAULIC DIRECTIONAL CONTROL VALVES

DO A BETTER JOB FOR YOU

Pathon MANUFACTURING CO.

3823 Pacific Avenue Cincinnati 12, Ohio



* The gannet, largest of all North Atlantic birds (wing span 6 feet), is also famous as a world champion deep sea diver. The gannet's dive is so spectacular it has been studied with interest by aerodynamics experts. Streaking toward the water like an arrow, a gannet in pursuit of fish will descend as much as ninety feet beneath the surface. The resulting splash sometimes rises ten feet. Special air cells in the gannet's breast absorb the terrific shock as the bird hits the water. The gannet's water-sealing and shock absorbing system is another wonder of nature.

THE BIRD WITH SHOCK PROTECTION

Minnesota O-Rings are "doughnut shaped" packings used as shaft seals in air, gas or hydraulic systems. Every day, leading product engineers are proving the dependability and wide application of O-Rings by discovering new uses for these unique seals. Minnesota O-Rings are made from special compounds of natural or synthetic rubber to meet exacting product specifications for close tolerances and uniform quality. Hundreds of successful installations have been designed into such equipment as hydraulic rams and regulating valves . . . remote control mechanisms . . . air cylinders . . . water pumps . . . gasoline and steam engines. For prompt analysis and quotation on your next packing installation, send us your blueprints or specifications.

* *The many advantages and applications of injection molded O-Rings merit your investigation. Bulletin available on request.*

Manufacturers of All Types of Small Rubber Parts

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Extra dependable industrial motors
1 TO 250 HORSEPOWER (N.E.M.A. STANDARDS)
Extra large "free-flo" air channels.
Liberal size grease lubricated bearings.
One-piece cast iron frames.
Permanently aligned cast iron brackets.
Also a complete line of Direct Current motors and generators
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DIVISION OF GENERAL DYNAMICS CORPORATION
BAYONNE, NEW JERSEY
HEART of the motor
3. Extra high-frequency testing of insulation between turns.
4. Extra care in fitting coils into stator.
The WINDING is the
1. Extra insulation in stator slots and between phases.
2. Extra impregnations and bakings of the wound stator.
QUALITY SINCE 1880
WRITE TODAY FOR NEW ILLUSTRATED CATALOGUE NO. 480

Letters to the Editor

Continued

manufactured by the Caterpillar Tractor Company, Peoria 8, Ill. Mr. Frank P. Hanson, Agricultural Engineer at this company would be able to give you full details.

Spider Shaped Rotor in Low Pressure Pump

Some place, perhaps in your magazine, I have seen an illustration of a low pressure pump in which a spider shaped rotor made of rubber is rotated eccentrically in a chamber. The equivalent of vanes absorb the eccentricity by bending. As I recall, the qualities claimed for it are the characteristics of a centrifugal pump, but having a positive suction lift. Could you give me any information as to the manufacturer?

J. M. GRIMSTAD
J. M. Grimstad Co.

The Jabsco Pump Co., Beverly Hills, Calif., make stainless steel and bronze, self priming pumps with neoprene rotors. These pumps are for cool liquids, high or low viscosity, clean or dirty fluids. These pumps may fit your requirements.

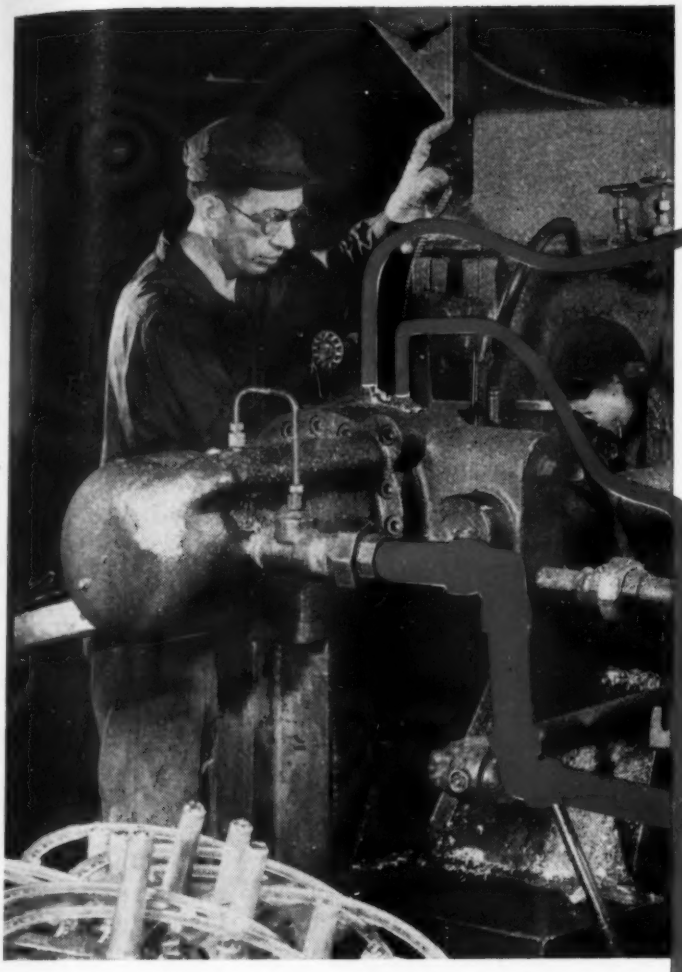
Readers who intend to submit an entry in the PRIZE PAPER CONTEST should ask for the Entry Blank at once. There is still time to win one of the major prizes. The Contest closes on June 1, 1953.

Sandwich Seals

In the February issue of APPLIED HYDRAULICS, page 40, application 6, a steel and synthetic rubber seal for use under bolt heads is described. Could you inform us whether such seals are available in this country or, give us the address of Dowty Seals, Ltd.

G. H. HOCHMUTH,
Standards Engineer,
Pratt & Whitney Div.
Niles-Bement-Pond Co.

The seal in question is an English design. An office is maintained under the title Dowty Corporation at 25 Beaver St., New York 4, N.Y. Precision Rubber Products Corporation, Oakridge Drive, Dayton 7, Ohio, exclusive American licensee for Dowty Seals, Ltd., is manufacturing a considerable number of these seals for aircraft use, particularly for engine use, and industrial applications under the trade name of Dynaseal.



Fire-resistant PYDRAUL cuts hydraulic fluid hazards

Hydraulically operated machines, like the die-caster in the picture, are often prey to vicious fires that start with a leak in a pressure line. Flammable hydraulic fluid escapes and sprays onto hot metal, turning to liquid flame that can burn or maim personnel, destroy stock and buildings.

Monsanto now provides a simple, effective answer to this problem which has cost American industry millions of dollars a year. Safe, economical Pydraul, a nonflammable-type fluid, is currently employed in more than 100 plant applications—with notable success.

Pydraul, when test-poured on molten metal and sprayed into an oxyacetylene flame, does not flash or ignite. It has high lubricity and is noncorrosive to metal . . . nonvolatile and insoluble in water. Because it requires no special changes in equipment, Pydraul can be introduced into a hydraulic system simply by draining and refilling. **Pydraul: Reg. U. S. Pat. Off.*

NO PYDRAUL HERE	PYDRAUL USED HERE
CASE No. 1 In a Southern steel tinning plant, a break in a hydraulic line released flammable spray that ignited oil. Fire loss: $925,000.	**CASE No. 3** When a hydraulic line parted, the fluid (Pydraul) sprayed into a hot zinc melting pot, splattered several employees. Result: no fire, no injuries, no production loss.
CASE No. 2 In a die-casting plant, rupture of a hydraulic line sprayed fluid over hot machines and gas-fired aluminum melting furnace. Loss: $340,000.	**CASE No. 4** On a new die-casting machine, a hydraulic leak caused by faulty union sprayed Pydraul over equipment and molten aluminum. Result: No fire, no damage.
Write today for "Pydraul F-9," an engineering report. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 800 North Twelfth Blvd., St. Louis 1, Missouri.	MONSANTO CHEMICALS – PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

USEFUL LITERATURE

You'll find many valuable production and design ideas in publications described here . . . copies will be sent you free without obligation

OIL HYDRAULIC EQUIPMENT . . . Vickers, Inc. have published a new 56 page catalog No. 5001. This handsome brochure covers very extensively pumps, pressure controls, volume controls, directional controls, control assemblies, hydraulic motors, transmissions, cylinders and hydraulic accessories. In the introduction to this catalog the increasing applications of hydraulic control to many types of machinery is outlined. Basic units which have been designed so that they can be combined with each other or with additional accessories to perform any oil hydraulic control function are described. Each section detailing the various components is illustrated, performance curves shown, operating characteristics and all other features listed. This booklet should prove very valuable to men who are designing, maintaining and building hydraulic circuits.

Circle 176 on Reader Service Card

ELECTRIC TIMERS . . . A new bulletin on electric timers has been published by Eagle Signal Corporation. These timers can start and stop motors, operate valves or any electrical control device which must operate with a delay or in a timed sequence. They provide automatic control to cut production costs and to improve the quality of a product. Covered are manual start timers, repeat cycle timers, aircraft and special timers and control panels. Product description, specifications, wiring diagrams and applications are all fully illustrated.

Circle 177 on Reader Service Card

HYDRAULIC PUMPS . . . The complete line of hydraulic pumps and fluid motors manufactured by Eastern Industries, Inc., has been published in Bulletin E 800. The catalog describes each series giving exact specifications as to weight, speed, capacities, etc. Also given are dimensional data for installation. Basic hydraulic circuits are shown.

Circle 178 on Reader Service Card

AIR FILTER . . . Universal Filter Company describe in Bulletin No. 304 their air filter for removing oil, water and all foreign matter from compressed air and gas. This filter applies the principle of centrifugal action, to secure separation of the larger particles of oil and water. The bulletin describes all features in detail, makes recommendations for installation and shows longitudinal and cross sectional drawings of the filter.

Circle 179 on Reader Service Card

ROLLER CHAIN . . . A comprehensive 148 page book, No. 2457, on roller chain and its application, has been published by the Link Belt Company. Detailed engineering information covers the selection, installation, lubrication and maintenance of roller chain for drives and conveyors and sprocket wheels. The book contains a large number of photographs and line drawings of the many types and sizes available. Also shown are over 50 typical conveyor attachments. Design notes and data serve as practical reference on the use of roller chain for both power transmission and conveying service. Formulas, charts, diagrams and typical problems are illustrated.

Circle 180 on Reader Service Card

HYDRAULIC OIL COOLER . . . A condensed set of drawings and performance curves for rapid selection of oil coolers for hydraulic applications are included in data sheets offered by the Harrison Radiator Division, General Motors Corporation.

Circle 181 on Reader Service Card

GASKETS AND PACKINGS . . . A folder describing gaskets, sheet packing and metal stampings made from all types of material, including plastic, rubber, fiber, felt and metals, has been issued by Melrath Supply and Gasket Co. Inc.

Circle 182 on Reader Service Card

REGULATING VALVES . . . A most comprehensive folder has been issued by the Atlas Valve Company. Described in this folder are pressure reducing valves, lever operated balanced valves and others for water, air, oil gas or steam. Each type featured is fully illustrated, its construction, operation and specification given. The folder also contains sections on pump governors, float valves, damper regulators, temperature regulators and feed water regulators.

Circle 183 on Reader Service Card

You'll find more reviews starting on page 102

Circle 32 on Reader Service Card

SAFEGUARDING INDUSTRY'S *Lifelines of Mobile Power*

how *Hydraulic power* delivered through

Eastman

HYDRAULIC HOSE ASSEMBLIES

helps "KEEP 'EM DOWN ON THE FARM!"

specify

Eastman
first in the field

HYDRAULIC HOSE ASSEMBLIES

for the best performance, for long life and satisfaction—*all along the line*—from manufacturer to user. Check your needs on the following list:

COUPLINGS

Solid Male

Swivel Male

Swivel Female

STRAIGHT AND ANGLED ADAPTER UNIONS

Straight Male

90° Male

45° Male

Write

for free catalog 103 on Eastman Hose Couplings and Bulletins 231B & 232B on Straight and Angled Adapter Unions.

EASTMAN Hydraulic Hose Assemblies on Massey-Harris Tractor.

Thanks to hydraulic power, many a man's job on the farm is a boy's job now ! Fingertip hydraulic control does away with aching arms, dog-tired from day-long tugging at levers to raise and lower tillage tools.

Massey-Harris, shipping agricultural tractors and implements to 106 countries the world over, has developed some of the most ingenious hydraulic controls to meet the needs of modern contour farming — controls which not only do most of the hard work—*but do it automatically !*

EASTMAN Hydraulic Hose Assemblies carry oil at 1000 psi from the Massey-Harris 2-Way, 2-Speed *"Depth-O-Matic"* Hydraulic Control to raise and lower tractor mounted implements smoothly, easily, swiftly. Synchronized slave cylinders handle harrows, discs, plows.

Massey-Harris *"Selective Control"* maintains uniform cultivator penetration on hillside contour slopes, pictured above, through independent action of right and left gangs. *"Delayed Action"* permits raising front and rear gangs independently at contour points, also permits shovels to leave and enter soil at same point at ends of rows.

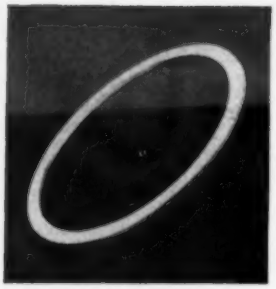
Other users of EASTMAN Hydraulic Hose Assemblies in the agricultural field include: Allis-Chalmers Mfg. Co.; J. I Case; John Deere Co.; The Farmhand Co.; Harry Ferguson, Inc.; Horn Manufacturing Co.; International Harvester Co.; Minneapolis-Moline Co.; Ottawa Steel Products Co.; Super-Six Manufacturing Co.; A. F. Wagner Iron Works.

Look to EASTMAN—first in the field—for continued leadership in "Safeguarding the Lifelines of Mobile Power"—in Industry and Agriculture !

Eastman

GARLOCK BITAN Leather Cups, Packings and Gaskets

GARLOCK CHEVRON Hydraulic Packings



GARLOCK GUARDIAN Asbestos-metallic Gasket

GARLOCK KLOZURE Oil and Grease Seals for Bearings

GARLOCK LATTICE-BRAID Rod and Shaft Packings

BITAN*
CHEVRON*
GUARDIAN*
KLOZURE*
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These familiar brand names are registered trade-marks belonging to The Garlock Packing Company. They are never to be used as generic terms to designate types of products and are properly used only to denote products manufactured by Garlock.

*Trade-Mark Reg. U.S. Pat. Off.

BITAN Leather Packings, CHEVRON Packings, GUARDIAN Gaskets, KLOZURE Oil Seals and LATTICE-BRAID Packings are all exclusive products of Garlock's own factories. So, wherever you see these trade-marks you can be sure that the products with which they are used are of proper design and are manufactured to the highest quality standards. They will give you long, dependable service.

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LITERATURE AND SERVICES OFFERED IN THIS MONTH'S ADS

For more information circle numbers on the reader service card bound in this issue.

IMPREGNATED LEATHER PACKING are featured in engineering handbook and technical literature available from C. W. Marsh Company.
Circle 67 on Reader Service Card

ROTARY COMPRESSOR and its advantages are outlined in Bulletin C-5 available from the Fuller Company.
Circle 38 on Reader Service Card

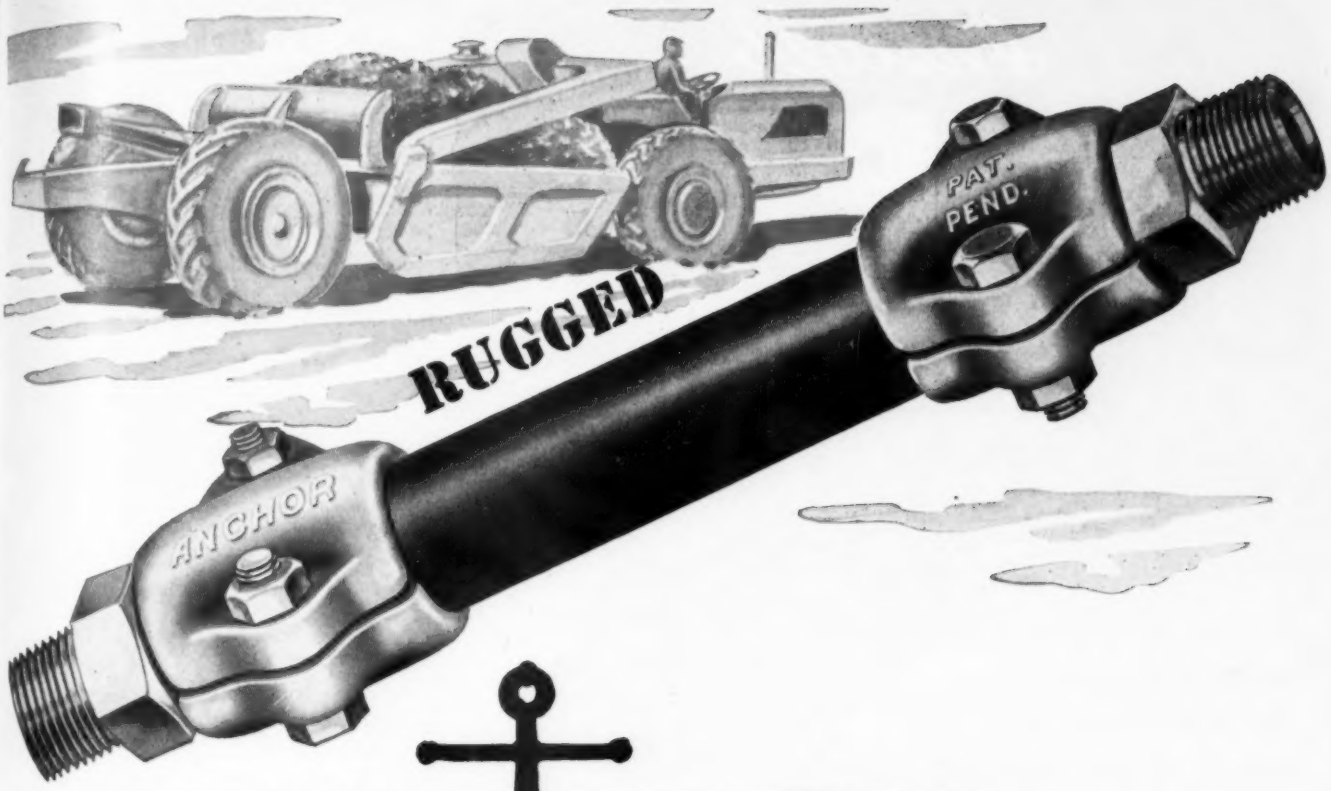
AIR TRAPS to solve sludge problems, are fully described in Catalog 751 offered by W. H. Nicholson & Co.
Circle 76 on Reader Service Card

PIPE PLUGS, when used with N.P.T.F. threading will withstand up to 3000 psi. pressure without leaking, are described in folder AP available from the Allen Manufacturing Co.
Circle 9 on Reader Service Card

MULTIPLE SECTION SERIES VALVE which permits operation of two or more cylinders under full or varying load are discussed in Bulletin 3104 published by the Sundstrand Machine Tool Co.
Circle 108 on Reader Service Card

MICRONIC FILTER which protects entire hydraulic system, is outlined in descriptive leaflet prepared by the Rucker Mfg. Co. It also contains flow rate and installation data.
Circle 99 on Reader Service Card

SERVICE DATA SHEETS on lead base babbit for the manufacture of bearings are available from the American Crucible Company.
Circle 11 on Reader Service Card



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— ideal for heavy-duty original-equipment service or emergency repairs in the field

For high or medium pressures—can be used with one- or two-wire braid hose.

Specially designed clamping segments — impulses can't shake them loose, yet coupling is reusable again and again.

Easy to apply — no special tools needed to assemble couplings and hose. Hose cover need not be stripped to apply coupling.

Neat Installation — made possible by compact design of the Anchor clamp and the use of streamlined Anchor adapter unions and related fittings.

Saves Time — you don't have to wait for repairs because you can make up your hose lengths as needed. Stocking problem minimized.

NEW!
REVOLUTIONARY
ANCHOR
SPLIT-FLANGE CLAMP
Positive leakproof connection without threaded joints. Bolt centers are located to distribute the forces evenly and prevent tilting of the clamp halves. Easy to assemble with small automotive-type wrench.

Get more details. Attach coupon to your letterhead and mail today.

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D-14

Anchor Coupling Co. Inc.
Dept. AH-4, Libertyville, Illinois

I'd like to know more about

- ☐ Anchor clamp-type reusable couplings
- ☐ New Anchor Split-flange clamp.

Send me detailed information.

Name..... Title.....

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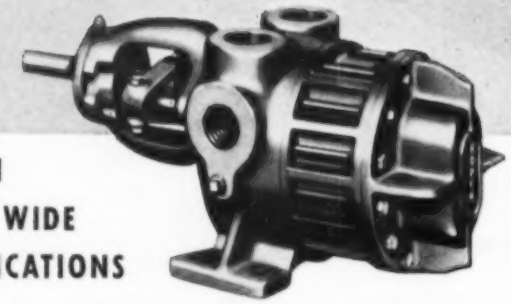
Install ROPER ROTARY PUMPS

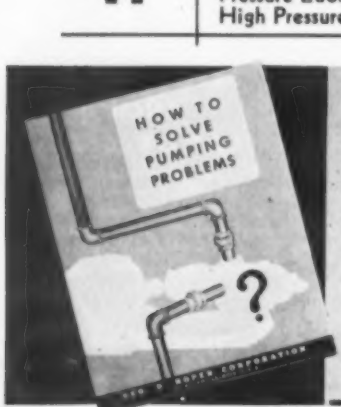
for Positive Results



SERIES F PUMP

MODELS FOR AN EXCEPTIONALLY WIDE RANGE OF APPLICATIONS

SERIES	TYPICAL USES	PRESSURES	SIZES
3600	All Petroleum Handling Grease Compounding Oil Circulating General Transfer	to 60 P.S.I.	40-300 G.P.M.
F	Pressure Lubrication Hydraulic Power Fuel Transfer Lube Oil Transfer	to 300 P.S.I.	1-300 G.P.M.
K	Pressure Lubrication Hydraulic Service Industrial Oil Burner Fuel Supply	to 150 P.S.I.	¾-50 G.P.M.
H	Hydraulic Power Test Equipment Pressure Lubrication High Pressure Coolant	to 1000 P.S.I.	5-75 G.P.M.



NEW! LATEST EDITION OF THIS BOOKLET NOW READY FOR YOU! SEND FOR YOUR FREE COPY

A valuable guide covering important fundamentals of estimating requirements of the average pumping job. It includes tables, charts, sample problems, and other pertinent data. SEND COUPON BELOW.

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Please Send Booklet—"How to Solve Pumping Problems"

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ROPER Rotary Pumps

Free Literature Offered in this Month's Ads

Continued

REUSABLE HOSE ENDS and industrial hose is the subject of catalog H 1451, listing complete range of sizes and pressure available. The booklet was published by Weatherhead Co.

Circle 124 on Reader Service Card

REGULATOR - FILTER - LUBRICATOR, all in one unit, has been described in a catalog prepared by CCA Products Division, Breco Manufacturing Company.

Circle 24 on Reader Service Card

BREATHER FILTERS and liquid filters are the subjects of two booklets offered by Air-Maze Corporation.

Circle 7 on Reader Service Card

OIL FILTERS to prevent oil contamination are featured in a descriptive booklet offered by the Hilliard Corporation.

Circle 50 on Reader Service Card

ELECTRIC MOTORS for hydraulically operated equipment are described in catalog 480 available from Electro Dynamic, Division of General Dynamics Corp.

Circle 33 on Reader Service Card

AIR FILTER, the Aridifier, to insure proper operation on lines serving air tools, air hoists, foundry jogging machines and other equipment is described in a booklet prepared by Logan Engineering Co.

Circle 65 on Reader Service Card

METALLIC ROD WIPER which protects cylinder rods, machine spindles and guide pins, is outlined in literature available from Hydraulic Accessories Co.

Circle 51 on Reader Service Card

CHECK VALVES of one piece construction, light weight and low pressure drop, are outlined in illustrated circular A available from Waterman Engineering Co.

Circle 123 on Reader Service Card

Continued on page 33

If one Answer is "YES" you should enter the first

APPLIED HYDRAULICS PRIZE CONTEST

DO YOU...

Design or sell hydraulic or pneumatic components?

Lay out your own customers' circuits?

Design machine tools or special machines or equipment?

Convert machines and equipment to automatic operation?

Build accessories for your own machines?

Assemble your own or customers' machines or equipment?

"Trouble Shoot" on circuits?

Operate or supervise a department in your plant?

Repair and rebuild components?

Have the responsibility for supervising or performing maintenance?

A total of

$1200.00 in Cash Prizes

will be awarded to the papers designated as best by the judges.

Awards

FIRST PRIZE	$500.00
SECOND PRIZE	$300.00
THIRD PRIZE	$200.00
Fourth, Fifth, Sixth & Seventh Prizes, ea.	$ 50.00

No matter whether your job is to sell hydraulic and pneumatic components and systems or design tools, equipment and machines or apply, install, operate and maintain such circuits in your own or customers' shop, you have an equal opportunity to win a Prize.

To enter the Prize Contest, simply send for the Entry Blank. The Rules of the Contest and Suggestions to Contestants will be sent promptly with the Entry Blank.

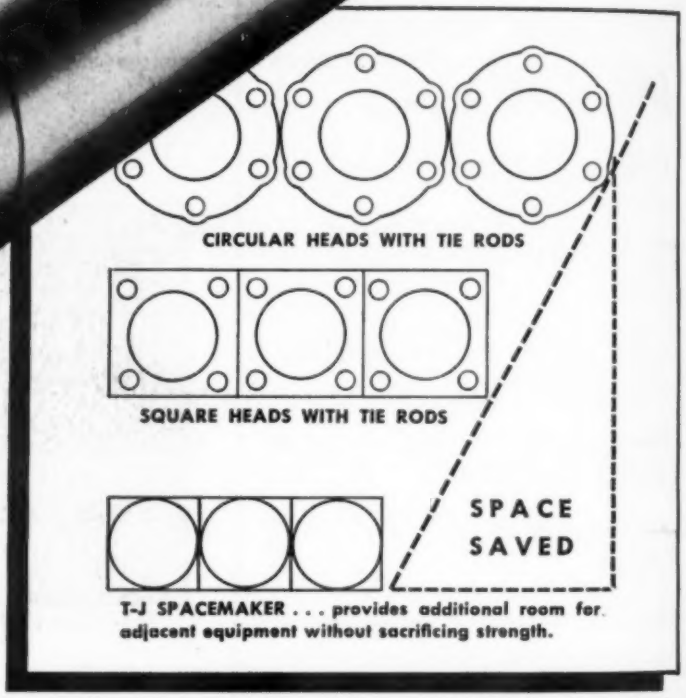
The closing date for the APPLIED HYDRAULICS PRIZE CONTEST is June 1, 1953.

For Entry Blank, write to:

APPLIED HYDRAULICS PRIZE CONTEST EDITOR

1240 ONTARIO STREET • CLEVELAND 13, OHIO

NEW T-J Spacemaker AIR CYLINDERS



T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

- SAVES UP TO 40% SPACE WITH NEW STREAMLINED DESIGN.
- SUPER STRENGTH . . . EXTRA HIGH SAFETY FACTOR
- SOLID STEEL HEADS
- HEAVY WALL, PRECISION HONED, HARD CHROME PLATED, SEAMLESS STEEL BODY
- LEAKPROOF CYLINDER HEAD TO BODY CONSTRUCTION.
- RELATIVE PORT POSITIONS MAY BE ROTATED WITHOUT DISASSEMBLY OF CYLINDER AND LOCKED IN DESIRED POSITION.
- HEAVY DUTY, HI-TENSILE, HARD CHROME PLATED PISTON ROD.

Streamlined construction of the new T-J Cylinders *eliminates tie rods . . . reduces head size . . .* and *saves up to 40% in mounting space!* In addition, a new high in strength is achieved with solid steel heads and heavy wall seamless steel body . . . leakproof construction . . . extra high safety factor.

Cylinder walls are precision honed and hard chrome plated for long-life efficiency. Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . both cushioned and non-cushioned . . . for wide range of pushing, pulling, lifting, clamping or control jobs. T-J dependability. *Fast delivery* to meet rush requirements. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.

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Many More Advanced Features!

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TOMKINS-JOHNSON
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Free Literature Offered in this Month's Ads

Continued

O-RING TUBE COUPLINGS and their advantages are detailed in Bulletin AH-101 issued by Lenz Company.

Circle 62 on Reader Service Card

TRIPLEX PUMPS manufactured by Kobe Inc. are described in a Bulletin.

Circle 58 on Reader Service Card

HYDRAULIC CYLINDERS having heads retained by a screw thread for maximum strength, are described in a catalog available from Pathon Manufacturing Co.

Circle 83 on Reader Service Card

VARIABLE SPEED PULLEY AND TRANSMISSION is the title of an illustrated catalog, containing complete technical data on these units. It is offered by Lovejoy Flexible Coupling Co.

Circle 66 on Reader Service Card

AIR CYLINDERS and hydraulic cylinders are described in Bulletins A 105 and H 104, published by Miller Motor Company.

Circle 70 on Reader Service Card

RUBBER BUSHED FLEXIBLE COUPLING made in a wide range of sizes and capacities is the subject of a catalog prepared by Ajax Flexible Coupling Co. Inc.

Circle 8 on Reader Service Card

NON-FLAMMABLE FLUID for hydraulic applications where high heat or fire hazards are problems, is described in booklet Pydraul F 9 available from Monsanto Chemical Co.

Circle 72 on Reader Service Card

AIR OPERATED, OIL CONTROLLED CYLINDER, the Hydro-Check, and its positive control of pneumatic operation is outlined in bulletin HC 600, offered by The Bellows Co.

Circle 19 on Reader Service Card

Continued on page 36

Specially Compounded For Both New Equipment and Maintenance Installations

In the drilling, refinery or pipeline operation on both new equipment and maintenance work, specially compounded Parco "O" Rings do the job better. Parco "O" Rings are rubber combinations blended to meet your specifications and molded to tolerances that make them superior seals for both static and dynamic use. For your assurance and best protection of smoother running and longer wearing hydraulic seals, insist on Parco. Other Parco rubber products used in the oil industry meet the same high standards of Parco "O" Ring quality Specify a superior product at no premium to you. All dash numbers of 6227, 6230 and 6290 series for commercial applications or Army-Navy installations to Specifications MIL-P-5516 (6227 and 6230) and MIL-G-5510 (6290) are available from stock. Silastics and other special compounds are available on order.

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Air and Hydraulic Cylinders

Furnished with Cartridge Type Packing Glands
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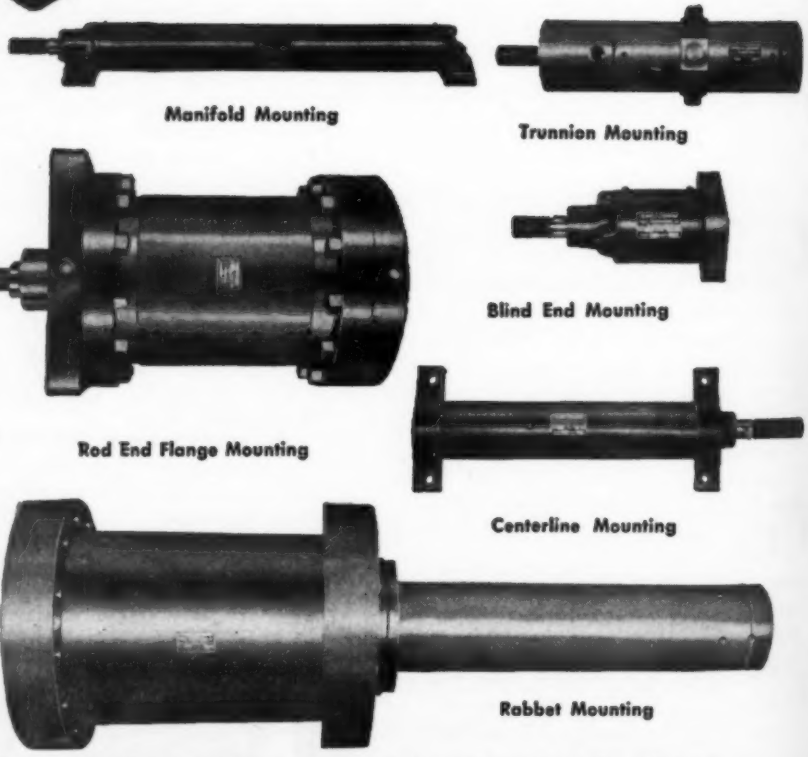
PETCH MANUFACTURING COMPANY is equipped to design and manufacture special cylinders in large or small lots to suit your requirements . . . ready and able to show how you can improve your operations and lower costs with precision built PEMACO Air and Hydraulic Cylinders. Our Engineering Department is at your service on any special application. Field Engineers are located throughout the United States in Industrial Centers.



Manifold Mounting

Trunnion Mounting

Blind End Mounting

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Centerline Mounting

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Weatherhead All-Steel Reusable Hose Ends outwear *many* lengths of hose—a saving proved by actual field tests.

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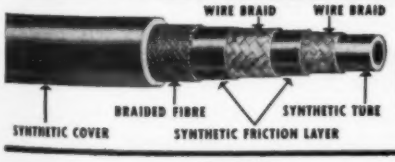
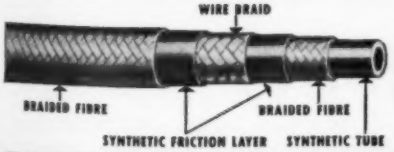
H-17 MEDIUM PRESSURE
DOUBLE FIBRE BRAID
SYNTHETIC COVER



H-25 HIGH PRESSURE
DOUBLE WIRE BRAID
SYNTHETIC COVER



H-69 MEDIUM HIGH PRESSURE
SINGLE WIRE BRAID
IMPREGNATED BRAIDED FIBRE

H-108 MEDIUM HIGH PRESSURE
SINGLE WIRE BRAID
SYNTHETIC COVER

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Free Literature Offered in this Month's Ads

Continued

SHUT-OFF VALVE which automatically cuts out pressure gage from system when hydraulic or pneumatic pressure goes beyond its operating limit, is described in a bulletin offered by Sprague Engineering and Sales Corp.

Circle 104 on Reader Service Card

RUBBER DIAPHRAGMS compounded with properties to resist various fluids and gases are discussed in a rubber handbook available from Acushnet Rubber Co.

Circle 3 on Reader Service Card

CYLINDERS which feature rotatable heads, self adjusting piston rod packing and socket head cap screws are described in bulletin 701 for hydraulic; and bulletin 703 for air cylinders. Both bulletins are published by Lindberg Engineering Co.

Circle 64 on Reader Service Card

INJECTION MOLDED O-RINGS which function in hydraulic systems, hydraulic valves, air cylinders and lubricators, motors and many others, have been described in O-ring catalog available from Minnesota Rubber and Gasket Co.

Circle 71 on Reader Service Card

PNEUMATIC CYLINDER for throttling control is featured in Bulletin B-50-AH prepared by Conoflow Corporation.

Circle 28 on Reader Service Card

AIR CYLINDER of new design, to save up to 40 percent space, and eliminates tie rods, is described in Bulletin 8152 released by Tomkins-Johnson Co.

Circle 112 on Reader Service Card

TENSION LINKAGES is the title of bulletin No. 51-10 prepared by the Chain Belt Co. Shown are typical examples of tension linkage applications, helpful data on equipment selection, tables of dimensional data and other important facts.

Circle 26 on Reader Service Card

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Take heavy mechanical equipment, for instance. There's a Tycol lubricant for any application you name: For instance, what about steam turbines? . . . Tycol Aturbrio oils resist heat and sludging, are "double inhibited" to provide the utmost resistance to rust and oxidation. Diesels? . . . Tycol Adelbus oils contain additives that produce a tough "film of protection" and help to eliminate sludge and varnish. You always get top performance with Tycol lubricants. Why? . . . Because each Tycol grease and oil is manufactured from high quality base stocks and *tailored* for a specific application. Get the full story of the entire Tycol line from your local Tide Water Associated office today!

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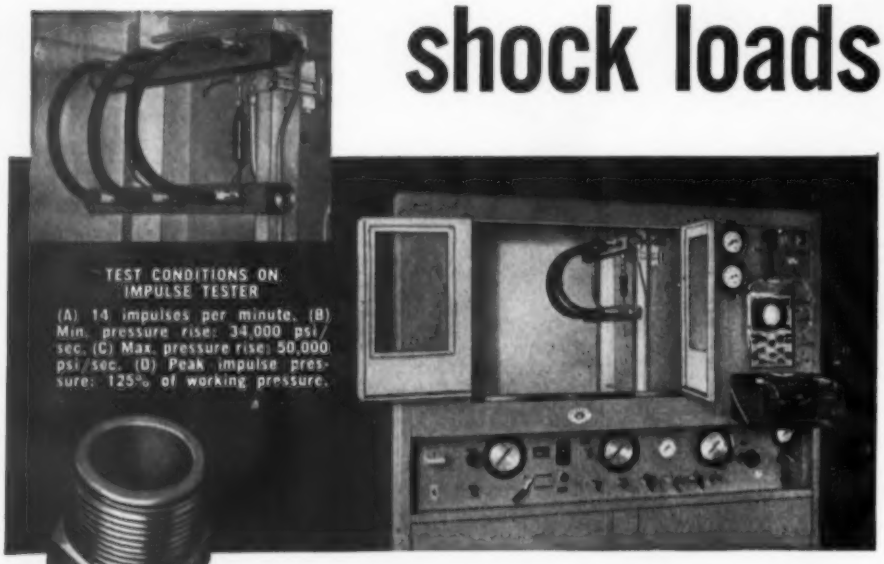
Subjected to toughest hose test . . . yet

still OK after 147,000 shock loads


TEST CONDITIONS ON IMPULSE TESTER
(A) 14 impulses per minute. (B) Min. pressure rise: 34,000 psi/sec. (C) Max. pressure rise: 50,000 psi/sec. (D) Peak impulse pressure: 125% of working pressure.

RESISTOFLEX INDUSTRIAL HYDRAULIC HOSE ASSEMBLIES

offer high burst strength, too!

The hydraulic impulse test, as outlined in military spec. MIL-H-5511, shows how well these *industrial* hose assemblies resist fatigue.

To this 100,000 cycle test, while plenty tough by itself, Resistoflex added a 160°F requirement—making it the toughest hose test yet. Despite this, Resistoflex medium-high pressure assemblies were still going strong after 147,000 cycles . . . at which time attempts to fatigue the assemblies were abandoned as futile.

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5. No gumming or clogging of hydraulic circuit—Compar tube inert to all hydraulic oils.

I.D. (inches)	Working Pressure (psi)	Min. Burst Pressure (psi)	Assembly Tensile Strength (lbs.)
¼	2300	9200	900
⅜	2050	8200	2500
½	1800	7200	3500

Write for Data Sheet MH-17.

RESISTOFLEX
CORPORATION
Belleville 9, New Jersey

SPECIALLY ENGINEERED FLEXIBLE RESISTANT PRODUCTS FOR INDUSTRY

Free Literature Offered in this Month's Ads

Continued

AIR CONTROL EQUIPMENT manufactured by Hannifin Corporation is detailed in Bulletin 231.

Circle 48 on Reader Service Card

AIR CONTROL VALVES are the subject of a bulletin prepared by the Automatic Valve Co.

Circle 17 on Reader Service Card

LEATHER OR SYNTHETIC RUBBER PACKINGS are covered in a catalog describing all types of packings with size data and applications. The catalog is published by Graton & Knight Co.

Circle 44 on Reader Service Card

PROTECTORS to prevent damage to threaded parts, tubing, fittings, valves, aircraft and hydraulic parts, are described in catalog prepared by Protective Closures Co. Inc.

Circle 89 on Reader Service Card

HYDRAULIC REMOTE CONTROLS for automotive, railroad, machine tools and other applications, are discussed in a catalog issued by Sperry Products, Inc.

Circle 103 on Reader Service Card

HOW TO SOLVE PUMPING PROBLEMS is the title of the latest catalog published by Geo. D. Roper Corporation. Covered are important fundamentals of estimating requirements of the average pumping job, sample problems and other pertinent data.

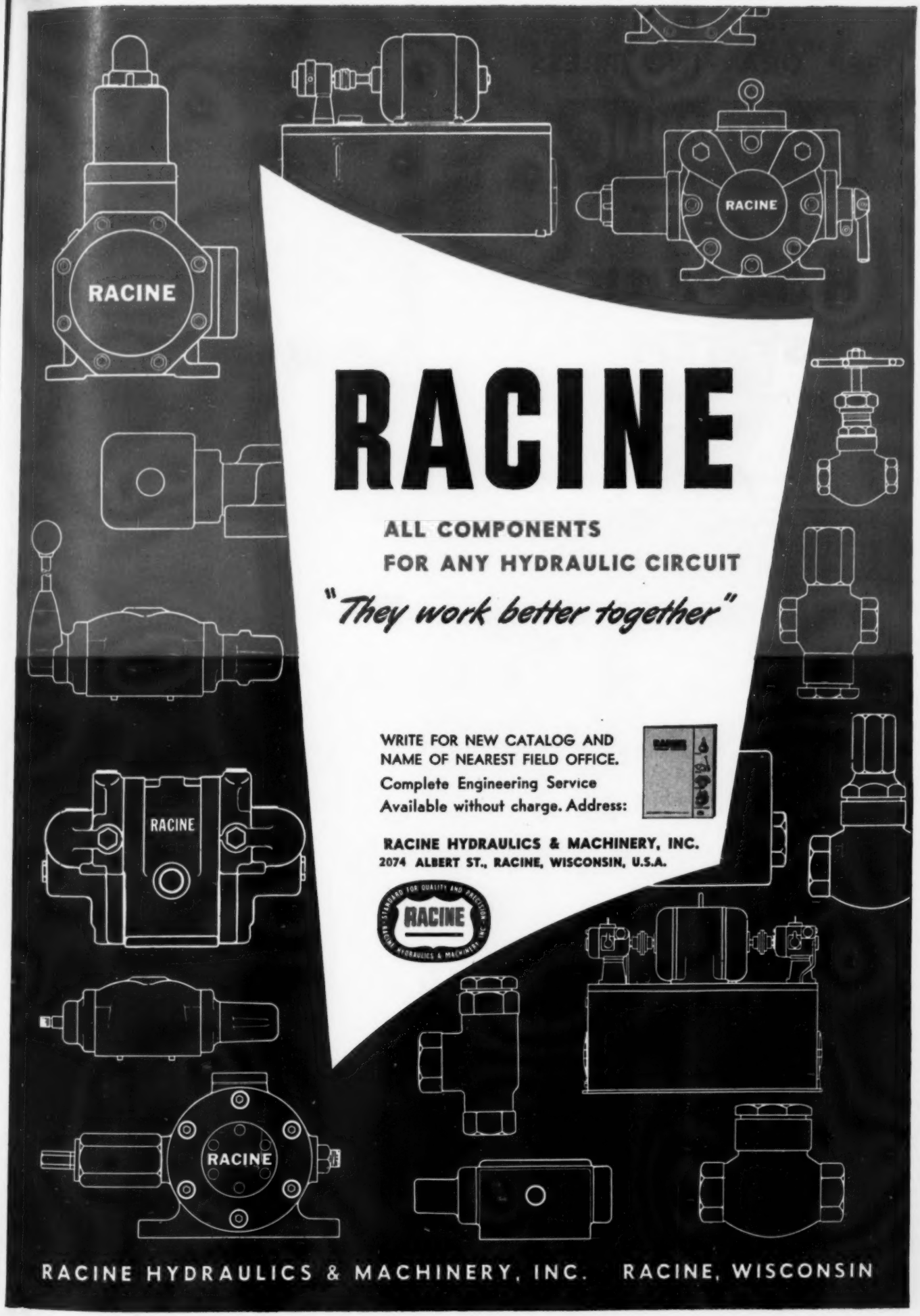
Circle 97 on Reader Service Card

AIR AND HYDRAULIC CYLINDERS furnished with cartridge type packing glands are detailed in engineering data offered by Petch Manufacturing Co.

Circle 86 on Reader Service Card

AIR COMPRESSORS of the rotary-vane type are discussed in a catalog and applications idea booklet issued by Gast Manufacturing Corp.

Circle 42 on Reader Service Card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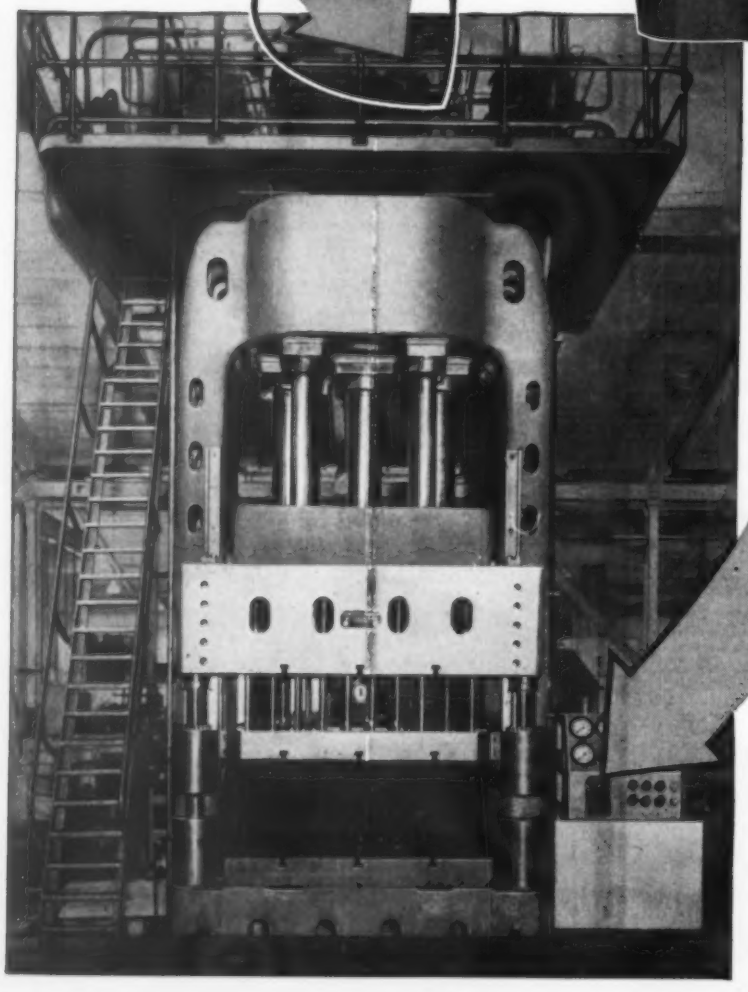
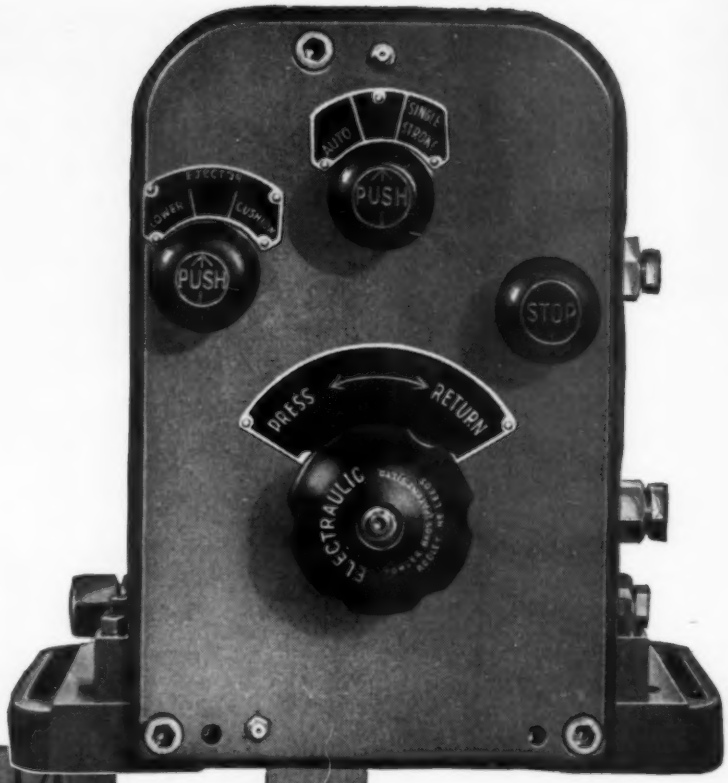
THE PUMP IS THE HEART OF THE PRESS





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TR-37

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use the HANSEN man's know-how

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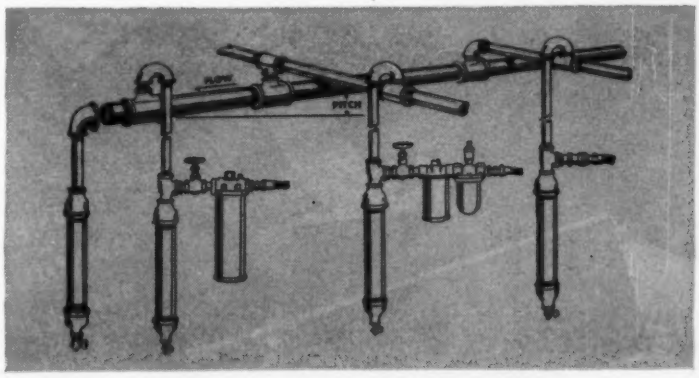
Quick-Connective Couplings Are His Business

BUT SO ARE AIR LINE PROBLEMS



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One-Way Shut-Off

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ALSO STRAIGHT-THROUGH QUICK-CONNECTIVE COUPLINGS

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Controlled Air Power

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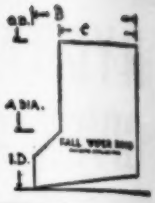
FOR FASTER, SAFER, BETTER PRODUCTION

SPECIFICATIONS—FALL WIPER RING

No. 749



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We Certify that the FALL WIPER RING complies with Spec. AN-6231 and with Spec. AN-S-60, with requirements of U.S. Air Forces Dwg. 48C362 and with ANA Bul. No. 367.

Finish—Cadmium Plating Spec. AN-P-81. 5 Degrees Taper in I. D. From Wiper Edge. 45 Degrees Taper Slot by .016 One Side Only.

Always Be Sure— USE **FALL WIPER RINGS**

Dwg. 48C362 WIPER,—Packing Gland Ring Spec. AN-6231 Spec. AN-S-60 USAF Part No.	SPEC. AN-6231 SCRAPER,—Rod, Hydraulic Piston Spec. AN-S-60. USAF Part No.	FALL WIPER RING Spec. AN-6231, Spec. AN-S-60. Our Part Number	Nom. Rod O. D.	WIPER O. D. +.000 —.005	WIPER I. D. +.002 —.003	A Dia. + or —.005	B + or —.010	C +.000 —.010
48C362- 1	AN6231A- 1	FWR-3C- 1*	1/2	.740	.494	.617	.125	.094
48C362- 2	AN6231A- 2	FWR-3C- 2*	9/16	.803	.556	.680	.125	.094
48C362- 3	AN6231A- 3	FWR-3C- 3*	5/8	.865	.619	.742	.125	.094
48C362- 4	AN6231A- 4	FWR-3C- 4	11/16	.928	.681	.804	.125	.094
48C362- 5	AN6231A- 5	FWR-3C- 5	3/4	.990	.744	.867	.125	.094
48C362- 6	AN6231A- 6	FWR-3C- 6	13/16	1.032	.805	.919	.125	.094
48C362- 7	AN6231A- 7	FWR-3C- 7	7/8	1.094	.868	.982	.125	.094
48C362- 8	AN6231A- 8	FWR-3C- 8	15/16	1.157	.930	1.044	.125	.094
48C362- 9	AN6231A- 9	FWR-3C- 9	1	1.219	.993	1.106	.125	.094
48C362-10	AN6231A-10	FWR-3C-10	1- 1/16	1.282	1.055	1.169	.125	.094
48C362-11	AN6231A-11	FWR-3C-11	1- 1/8	1.344	1.118	1.232	.125	.094
		FWR-3C-12	1- 3/16	1.407	1.180	1.294	.125	.094
		FWR-3C-13	1- 1/4	1.469	1.243	1.356	.125	.094
		FWR-3C-14	1- 5/16	1.594	1.305	1.450	.125	.094
		FWR-3C-15	1- 3/8	1.657	1.368	1.512	.125	.094
		FWR-3C-16	1- 7/16	1.719	1.430	1.575	.125	.094
		FWR-3C-17	1- 1/2	1.782	1.493	1.638	.125	.094
		FWR-3C-18	1- 5/8	1.907	1.618	1.763	.125	.094
		FWR-3C-19	1- 3/4	2.032	1.743	1.888	.125	.094
		FWR-3C-20	1- 7/8	2.157	1.868	2.013	.125	.094
		FWR-3C-21	2	2.282	1.993	2.138	.125	.094
		FWR-3C-22	2- 1/8	2.407	2.118	2.263	.125	.094
		FWR-3C-23	2- 1/4	2.532	2.243	2.388	.125	.094
		FWR-3C-24	2- 3/8	2.657	2.368	2.513	.125	.094
		FWR-3C-25	2- 1/2	2.782	2.493	2.638	.125	.094
		FWR-3C-26	2 5/8	2.969	2.618	2.794	.140	.109
		FWR-3C-27	2 3/4	3.094	2.743	2.919	.140	.109
		FWR-3C-28	2 7/8	3.219	2.868	3.044	.140	.109
		FWR-3C-29	3	3.344	2.992	3.169	.140	.109
		FWR-3C-30	3 1/8	3.469	3.117	3.294	.140	.109
		FWR-3C-31	3 1/4	3.594	3.242	3.419	.140	.109
		FWR-3C-32	3 3/8	3.719	3.367	3.544	.140	.109
		FWR-3C-33	3 1/2	3.844	3.492	3.669	.140	.109
		FWR-3C-34	3 5/8	3.969	3.617	3.794	.140	.109
		FWR-3C-35	3 3/4	4.094	3.742	3.919	.140	.109
		FWR-3C-36	3 7/8	4.219	3.867	4.044	.140	.109
		FWR-3C-37	4	4.407	3.992	4.200	.156	.125
		FWR-3C-38	4 1/8	4.532	4.117	4.325	.156	.125
		FWR-3C-39	4 1/4	4.657	4.242	4.450	.156	.125
		FWR-3C-40	4 3/8	4.782	4.367	4.575	.156	.125
		FWR-3C-41	4 1/2	4.907	4.492	4.700	.156	.125
		FWR-3C-42	4 5/8	5.032	4.617	4.823	.156	.125
		FWR-3C-43	4 3/4	5.157	4.742	4.950	.156	.125
		FWR-3C-44	4 7/8	5.282	4.867	5.075	.156	.125
		FWR-3C-45	5	5.407	4.992	5.200	.156	.125
		FWR-3C-46	5 1/8	5.532	5.117	5.325	.156	.125
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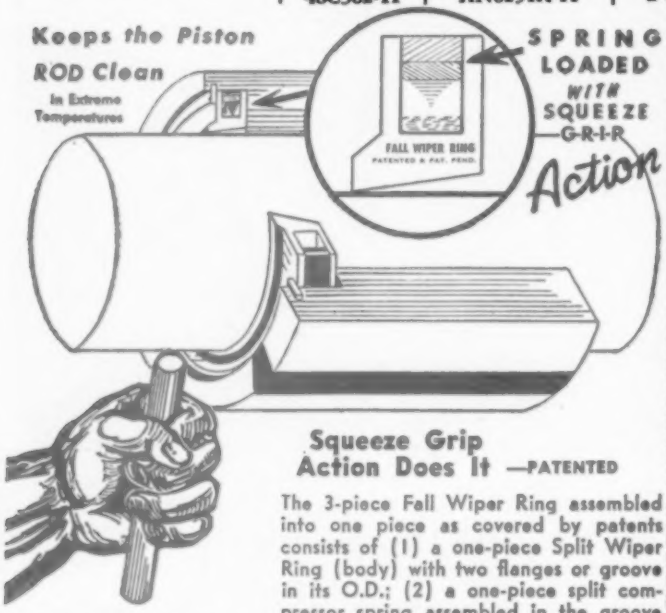
		FWR-3C-48	5 3/8	5.782	5.367	5.575	.156	.125
		FWR-3C-49	5 1/2	5.907	5.492	5.700	.156	.125
		FWR-3C-50	5 5/8	6.094	5.617	5.856	.172	.141
		FWR-3C-51	5 3/4	6.219	5.742	5.982	.172	.141
		FWR-3C-52	5 7/8	6.344	5.867	6.106	.172	.141
		FWR-3C-53	6	6.469	5.992	6.232	.172	.141
		FWR-3C-54	6 1/4	6.719	6.242	6.482	.172	.141
		FWR-3C-55	6 1/2	6.969	6.492	6.732	.172	.141
48C362-56	AN6231A-56	FWR-3C-56	6 3/4	7.219	6.742	6.982	.172	.141
48C362-57	AN6231A-57	FWR-3C-57	7	7.469	6.992	7.232	.172	.141
48C362-58	AN6231A-58	FWR-3C-58	7 1/4	7.719	7.242	7.482	.172	.141
48C362-59	AN6231A-59	FWR-3C-59	7 1/2	7.969	7.492	7.732	.172	.141
48C362-60	AN6231A-60	FWR-3C-60	7 3/4	8.219	7.742	7.982	.172	.141
48C362-61	AN6231A-61	FWR-3C-61	8	8.469	7.992	8.232	.172	.141
48C362-62	AN6231A-62	FWR-3C-62	8 1/2	8.969	8.492	8.732	.172	.141
48C362-63	AN6231A-63	FWR-3C-63	9	9.469	8.992	9.232	.172	.141
48C362-64	AN6231A-64	FWR-3C-64	9 1/2	9.969	9.492	9.732	.172	.141
48C362-64P	AN6231A-64P	FWR-3C-64P	9 3/4	10.219	9.737	9.982	.172	.141
48C362-65	AN6231A-65	FWR-3C-65	10	10.469	9.992	10.232	.172	.141
48C362-66	AN623-A-66	FWR-3C-66	10 1/2	10.969	10.492	10.732	.172	.141
48C362-67	AN6231A-67	FWR-3C-67	11	11.469	10.992	11.232	.172	.141
48C362-68	AN6231A-68	FWR-3C-68	11 1/2	11.969	11.492	11.732	.187	.156
48C362-69	AN6231A-69	FWR-3C-69	12	12.469	11.992	12.232	.187	.156
48C362-70	AN6231A-70	FWR-3C-70	12 1/2	12.969	12.492	12.732	.187	.156
48C362-71	AN6231A-71	FWR-3C-71	13	13.469	12.992	13.232	.187	.156

Keeps the Piston ROD Clean In Extreme Temperatures



Squeeze Grip Action Does It —PATENTED

The 3-piece Fall Wiper Ring assembled into one piece as covered by patents consists of (1) a one-piece Split Wiper Ring (body) with two flanges or groove in its O.D.; (2) a one-piece split compressor spring assembled in the groove (3) an endless cover band surrounding the spring in the groove which causes a squeeze grip action on the piston rod.

The Fall Wiper Ring is available from ½" to 13" dia. Military part numbers from AN6231A1 to AN6231A71. Write, wire or phone us regarding your wiper needs.

Ace Products Company
Toledo 1, Ohio Phone ADams 6513

Used During World War II and ever since by the Military

Fall Wiper Rings Spec. MIL-S-5049 are AN Approved.

Covered by patents issued and patents pending

In Use Since 1944

Fall Wiper Ring SPRING LOADED

ACE PRODUCTS COMPANY

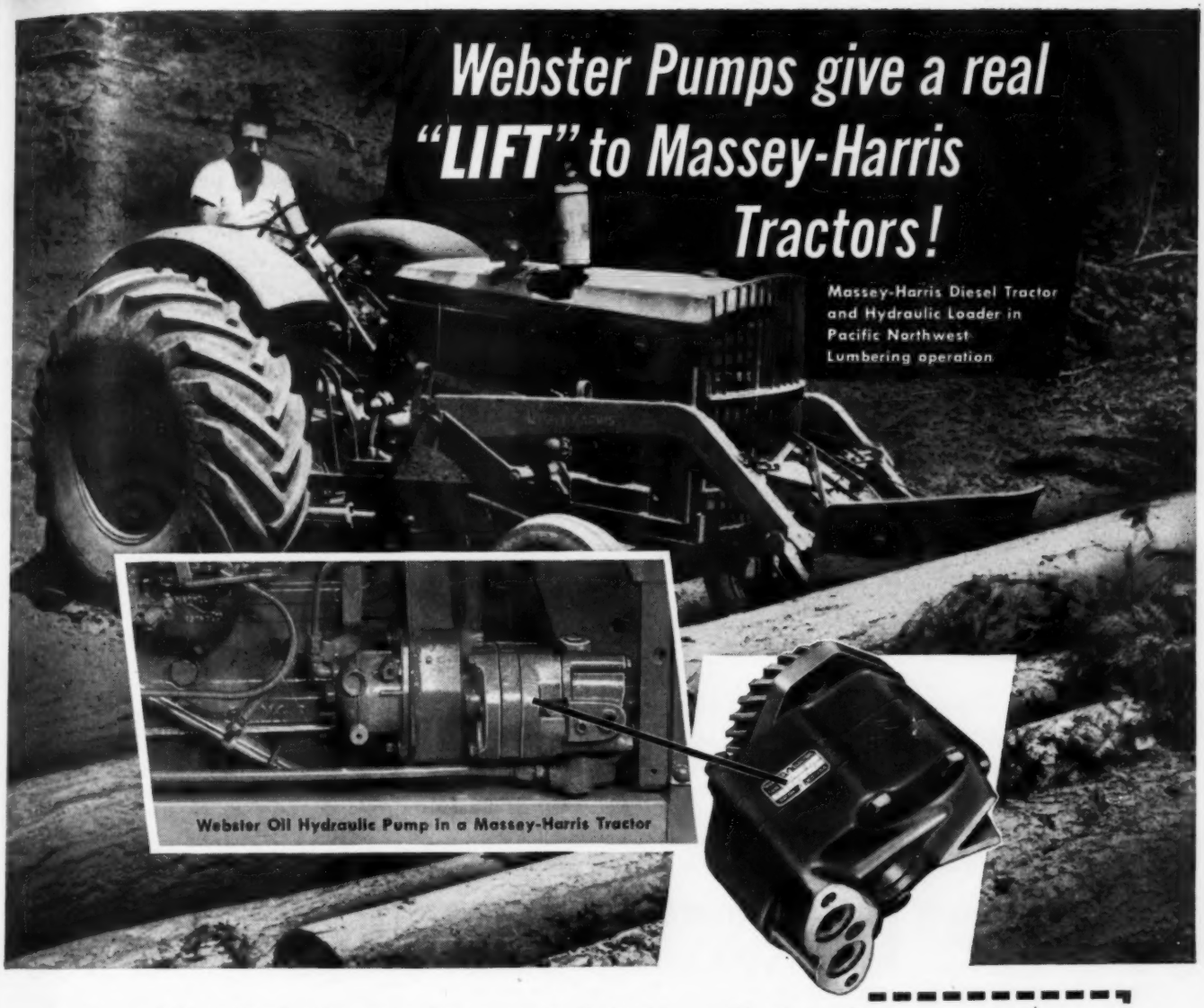
P. O. Box 784 Toledo 1, Ohio

Phone: Adams 6513

—2P or OS may be used instead of 3C. All comply with Spec. AN-6231 and AN-S-60.

(The above specifications formerly appeared in Aero Digest, Sept. 1949 and are reprinted here as a service to users of wiper rings.)

Webster Pumps give a real "LIFT" to Massey-Harris Tractors!



Massey-Harris Diesel Tractor and Hydraulic Loader in Pacific Northwest Lumbering operation

Webster Oil Hydraulic Pump in a Massey-Harris Tractor

• Dependable oil hydraulic power for tractors built by Massey-Harris—century-old manufacturer of quality farm equipment—is supplied in many different valve and cylinder variations by WEBSTER Gear-type Hydraulic Pumps.

Massey-Harris chose WEBSTER pumps for these reasons: Dependability and efficient operation in the field, easy mounting, and low cost power for mounted and pull-behind implements.

WEBSTER Hydraulic Pumps are available in a complete line from 10 gph. to 10 gpm., operating at pressures up to 1200 psi. at speeds of 3600 rpm or less—90 pumps of various designs and capacities to meet the widest range of applications. Internal relief valves are optional on all pumps.

We invite inquiry concerning your need for pumps for lubricating, oil circulating, transfer, filtering or oil hydraulic power applications. Mail coupon for full information.

Webster Electric Co., Racine, Wisconsin • Established 1909

OIL HYDRAULICS DIVISION

WEBSTER ELECTRIC

RACINE WISCONSIN

"Where Quality is a Responsibility and Fair Dealing an Obligation"

Oil Hydraulics Division, Webster Electric Company,
Dept AH-4, Racine, Wisconsin.

Send me information on Webster Hydraulic Pumps as checked:

Capacity (Approx.)_____gph. (or gpm.)

Pressure (Approx.)_____P.S.I.

Name and Title_____

Firm Name_____

Street Address_____

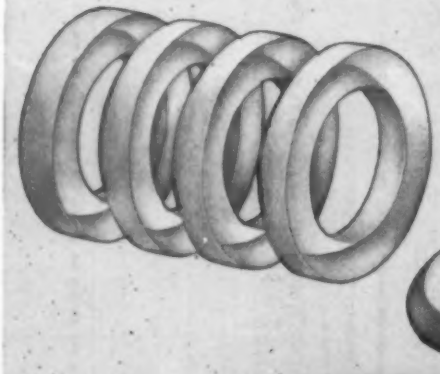
City_____ Zone_____ State_____

In Hydraulic Packing—TEFLON is fast supplanting leather.

Because Teflon is chemically inert—it requires no chemical inspection, is unaffected by all hydrocarbons and newer synthetic hydraulic fluids. Its service temperature range is from—110° F to +500° F. It has unsurpassed anti-friction properties, is extremely resilient, tough, long wearing. It is waterproof, nonflammable. It requires no water-soak for installation.

CHEM-O-GREEN BACK-UP RINGS are an outstanding example of TEFLON'S superiority. Made in solid, split or the spiral type, preferred by engineers, they solve the "O" Ring extrusion problem. A companion product to Chemiseal synthetic rubber "O" Rings, they are sold as a "Packing package" for all commercial and AN requirements. Write for Catalog OB-1152.

CHEMISEAL V-TYPE PACKING made of Teflon—is ideal for either manual or automatically operated hydraulic valves. Seals with low gland pressures and operating torque. Supplied in sets with square-end Teflon adaptors. Ask for Bulletin No. 810-V.



UNITED STATES GASKET COMPANY

FLUOROCARBON PRODUCTS DIVISION
CAMDEN 1, NEW JERSEY

Representatives in Principal Cities Throughout the World

ASLE Meeting to Feature Hydraulics Forum

The 8th annual meeting of the American Society of Lubricating Engineers will be held at Hotel Statler, Boston, on April 13, 14 and 15. An excellent group of papers, many of them of direct interest to hydraulic designers, equipment operators and maintenance personnel, are on the three day program.

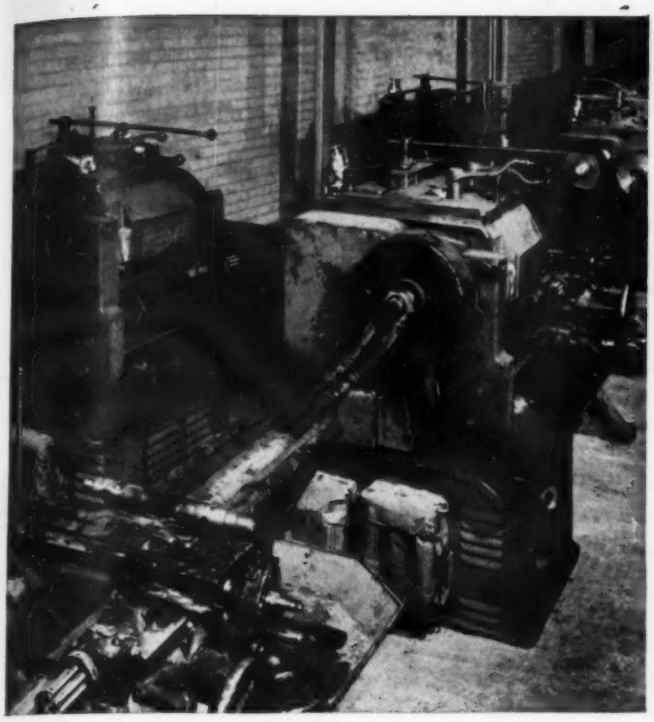
Of special interest is the Hydraulics Forum on "Training of Hydraulic Journeymen" arranged under the supervision of Don P. Morrell, Design and Standards Department, Ford Motor Co., and chairman of the ASLE Technical Committee on Hydraulics and Hydraulics Machinery. R. Q. Sharpe, Lubricating Department, Industrial Division, Socony-Vacuum Oil Co., Inc., will act as chairman for the Forum.

The Hydraulics Forum will be held Tuesday afternoon, the 14th. F. L. Mackin, chairman of the Machine, Woodworking and Hydraulic Departments, General Motors Institute, will act as panel moderator. On the panel are: Edwin Lerzack, hydraulics engineer, Oldsmobile Div., General Motors Corp.; Harold Blair, service engineer, E. F. Houghton & Co.; and Philip H. Emerick, manager, product service department, Vickers, Inc. This is the second Hydraulic Forum, the first held last year, proved to be one of the outstanding parts of the ASLE program.

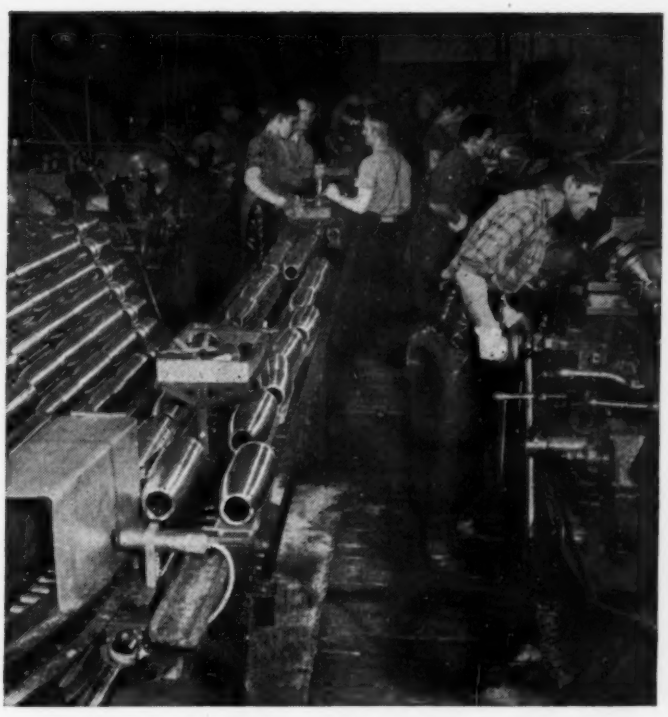
Other sections of the program will feature physical properties and additives of oils, high speed, rolling contact and sleeve bearings, processing and cutting lubricants, gear lubricants and practical application of laboratory test data.

National Conference Sets Up October Dates

The National Conference on Industrial Hydraulics will hold their ninth annual meeting at the Sheraton Hotel, Chicago, on October 8 and 9. From a preliminary report of the Paper Review Committee, it is assured that one of the most outstanding groups of technical papers will be on the Conference agenda. John G. Duba, Conference secretary, suggests, in view of the large attendance anticipated, that those who expect to attend pre-register early and make their hotel reservations.



HYDRAULIC SYSTEMS CONTAMINATED by external rust preventive which had seeped into the working parts. Hoffman anticipated a complete machinery teardown.



CLEANED WITHOUT TEARDOWN. Sunvis H.D. 700 Oils freed hydraulic systems and internal parts, enabled Hoffman to start production within the time specified by the Navy.

HYDRAULIC SYSTEMS OF MOTHBALLED MACHINES CLEANED WITHOUT TEARDOWN BY SUNVIS H.D. 700 OILS

Recently the U.S. Hoffman Machinery Corporation was asked to reopen a World War II Navy-owned shell-making plant and start production in three months. The machinery, idle for 5 years, had been protected by an external layer of rust preventive. Hydraulic lines were among the parts coated, and some of the protective material had seeped into them. It looked as if the machinery might have to be torn down to be cleaned.

Sun and several other oil companies surveyed the equipment and suggested cleaning methods. Hoffman chose Sun's recommendations because of their soundness and Sun's record for reliable service in other Hoffman plants. Sunvis H.D. 700 Oils freed up the hydraulic systems, many of which were extremely sluggish; and the detergency of these oils flushed away every trace of sludge and rust preventive. Sun Spirits did the external cleaning job. No dismantling of equipment was necessary.

Let Sun help you solve your hydraulic, metalworking and lubrication problems. Write for your copy of "Sunvis H.D. 700 Oils" or for the services of a Sun representative, without obligation, of course. SUN OIL COMPANY, Department AH-4, Philadelphia 3, Pa.

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO

ALL 3 AGREE

ON MARVEL *Synclinal* FILTERS

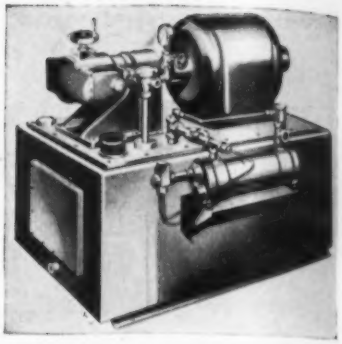
DESIGNERS

PRODUCTION MEN

MAINTENANCE MEN

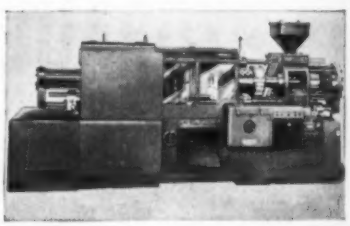
The regularity with which Marvel Synclinal Filters are selected by DESIGNERS—PRODUCTION MEN—MAINTENANCE MEN is an important consideration for you when selecting a FILTER for your machinery. It tells better than a thousand words why you can rely on MARVEL Synclinal Filters for dependable protection of liquids in all HYDRAULIC and LOW PRESSURE SYSTEMS.

It's sound business to protect the investment your machinery represents. Why not ask Marvel how you can enjoy the protection of Marvel Synclinal Filters—no cost or obligation to get the facts.



Large series hydraulic pumping unit manufactured by The Denison Engineering Co., are equipped with Marvel Synclinal Filters.

Model A-12 Hufford Stretch-Wrap Forming Machine manufactured by Hufford. Marvel Synclinal Filters are installed as standard equipment.



Reed-Prentice injection molding machine used at Superior Plastics, division of Commonwealth Plastics, Inc. are equipped with Marvel Synclinal Filters.

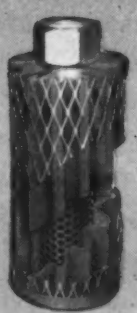
2½ TIMES MORE *ACTIVE* FILTERING AREA!

LINE TYPE (Cutaway)

Marvel Synclinal Filters are winning new laurels for performance with an ever-widening number of users. OVER 300 ORIGINAL EQUIPMENT MANUFACTURERS specify Marvel Synclinal Filters for protection to coolant and lubricating systems. Fine and large foreign particles which have an abrasive action on bearings or impair flow orifices are filtered out with Marvel Synclinal Filters.

Available in sump and line models, in capacities of 5 to 100 G.P.M., and in wire mesh sizes from 30 to 200. Multiple installations provide capacities as great as you may require. Both models are easy to disassemble, clean and reassemble. Line types operate in any position and may be serviced without disturbing pipe connections.

WATER FILTERS—Both our sump and line type models have been adapted for use in all water filtering applications. No changes have been made in the basic Synclinal design.



SUMP TYPE (Cutaway)

Write for Complete Engineering Data

—Specify Oil or Water

MARVEL *Engineering Company*

Meets J.I.C. Standards

625-D3 WEST JACKSON BLVD., CHICAGO 6, ILLINOIS

NEW PRODUCTS

Components, tools and equipment designed to improve operation of fluid power systems are described here . . . for more information fill in and mail the post card bound in this issue.

OIL HYDRAULIC PUMP

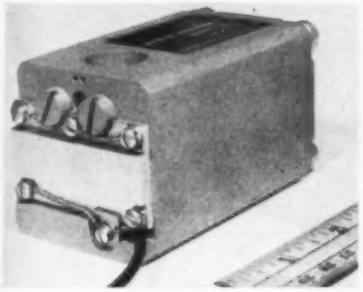
Features: These pumps are suitable for either open or closed hydraulic circuits. They are particularly adapted to heavy machinery drives requiring precise control of torque, acceleration and deceleration.

Application: For heavy duty service, including marine steering gears, winches and hoists, draw bridge lifts, extra large presses and machine tools, rotary machine drives, steel mill billet gougers and flying shears.

Sizes: These units are available in ten sizes with capacities of 28 to 2300 gpm, 50 to 400 hp in pressures of 2000-3000 psi.

Waterbury Tool, Division of Vickers, Inc. Waterbury, Conn.

Circle 141 on Reader Service Card



ELECTRO-HYDRAULIC VALVE

Designation: Model PC-1.

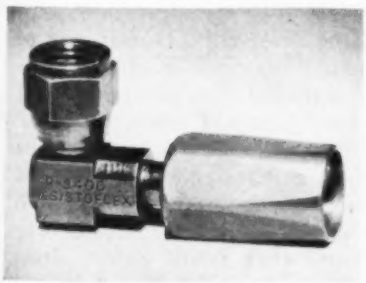
Size: Unit is 2 x 2 x 3.5 inches and weight is 1.4 pounds. Will operate with supply pressures from 500-3000 psi; power rating with 3000 psi supply is 4.2 hp.

Features: Regulates the differential pressure of hydraulic fluid at the output ports proportional to an electrical input signal. Basic design provides linear operation throughout its entire range.

Applications: In control systems of aircraft, guided missiles, rockets, radar antenna, fire control equipment, automatic machine tools and process controls.

Standard Controls, Inc. Seattle, Wash.

Circle 142 on Reader Service Card



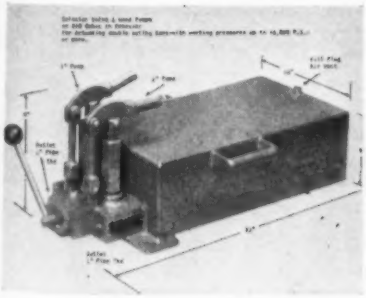
AIRCRAFT SWIVEL FITTING

Design: One-piece, steel elbows with swivel nut for use with ¼ and ⅜ inch MIL-H-5511 aircraft hose. Fittings provide 90 and 45 degrees angle turns in the fitting rather than with the hose. These internal angle passages are obtained by intersecting drill holes in machined carbon steel, unit bodies. No brazed or welded joints are used. With these fittings straight adapters can be used instead of angle adapters.

Sizes: Available in -4 and -6 sizes in both 45 and 90 degree angles.

Resistoflex Corporation Belleville, N. J.

Circle 143 on Reader Service Card



HAND PUMP PACKAGE

Features: This hand operated unit is equipped with a built-in selector valve by means of which the operator, by moving the lever from one side to the other, can apply or reverse the flow at will. No extra effort is required to change direction.

Construction: It is built with a 4 gallon reservoir and two hand operated pumps, ½ and 1 inch respectively, and two outlets, the selector valve determining through which pump the pressure is to be applied.

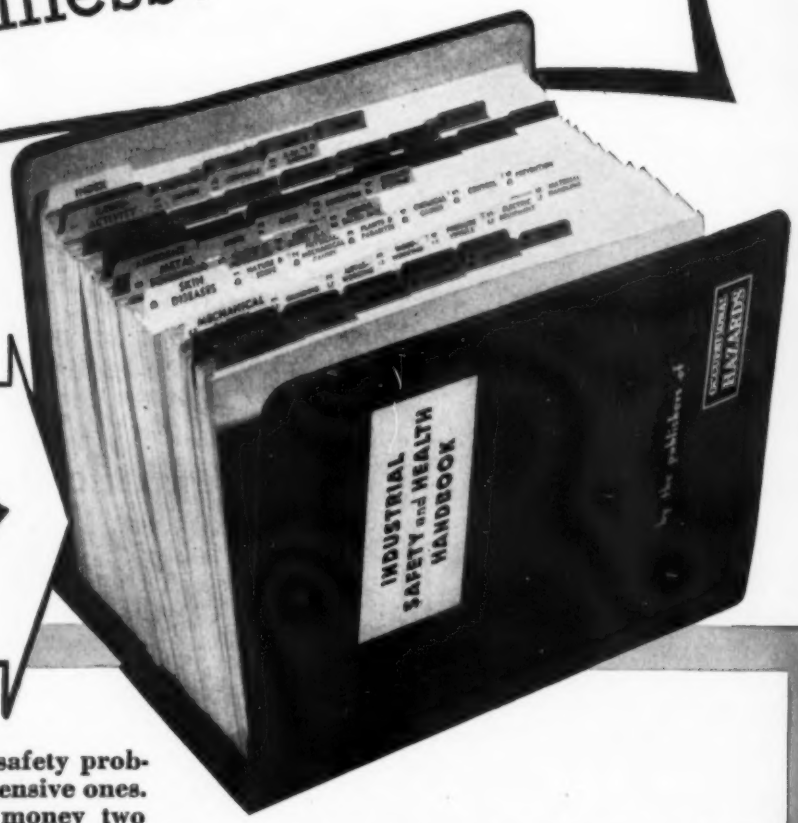
Applications: For use with double-acting, remote rams, and cylinders.

Wm. S. Pine Los Angeles, Calif.

Circle 144 on Reader Service Card

For more new product information turn to page 112

Do You Have Safety Problems in Your Business?



Here's the Answer!

If you employ people, you *have* safety problems. And they can be mighty expensive ones. Injuries and illnesses cost you money two ways: (1) work-sustained disabilities are compensated for, according to your state law, out of your pocket; (2) absence from the job costs even more in lost production, training replacements.

Safety can cut your costs—no matter what business you're in, regardless how many people you employ. And here's your guide to dollar savings through accident-prevention. Its 10 separate sections cover every phase of industrial safety and health, from Aluminum dust hazards to Zirconium's toxic properties.

It will tell you what the dangers are and how to eliminate them from your operations.

The Industrial Safety & Health Handbook is bound in a heavy-duty binder—and it has to be. It's made for continual, rough use: you'll soon find it the most valuable book on your desk. Its nearly 800 pages are indexed and color-tabbed for fast reference. You can get an immediate answer to any safety or health problem that arises. If you have no safety engineer, you'll need this book more than ever.

The Handbook is an authentic reference for fundamental facts on all phases of industrial safety. Indexed for quick reference.

The Handbook gives you an immediate answer to any hazard elimination. It gives you fast, non-technical information on hundreds of safety and health threats—and tells how to prevent them.

The Handbook is a compendium of all phases of safety education, written in non-technical language. Valuable source material for seasoned safety men, ideal background for men new to safety work.

This Handbook, published by Industrial Book Co., has been written and prepared by its affiliate, Occupational Hazards, Inc.

INDUSTRIAL BOOK CO.
1240-H Ontario St.
Cleveland 13, Ohio

Gentlemen:
Please send me ——— copies of the new Industrial Safety & Health Handbook at the price of $25 per copy.
(Check or money order enclosed —— Bill me ——)

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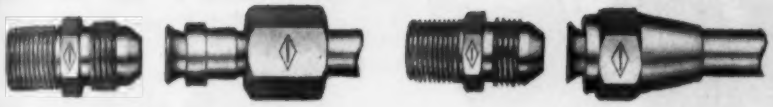
Everything you need . . .

for HYDRAULIC TUBING CONNECTION WORK

IMPERIAL 37° *Steel* FLARED TUBE FITTINGS



3-PIECE TYPE has sleeve which reduces wrench torque required in tightening. Permits bends close to joint.

2-PIECE TYPE can be used for same applications as 3-piece type —offers advantages in economy.

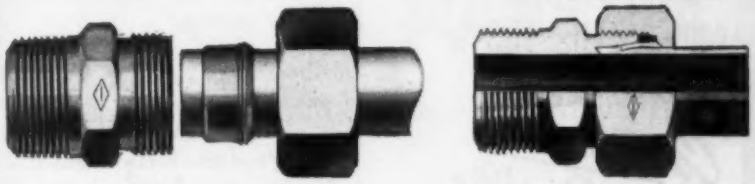
★ 2-Piece and 3-Piece Types. Withstand high pressure service and severe operating conditions.

★ Joints stay fluid-tight beyond burst pressure of the tubing. Meet J.I.C. requirements.

★ Used with J.I.C. and other soft steel tubing. Also copper, fully annealed stainless steel tubing, etc.

IMPERIAL *Steel* ERMETO TUBE FITTINGS

NO FLARING . . . NO THREADING . . . NO WELDING . . . NO SOLDERING



Fitting consists of 3 pieces: body, nut and sleeve.

When assembled, sleeve bites into tubing assuring a tight joint.

★ Make safe connections that withstand high pressures and vibration. Joints stay fluid-tight beyond burst pressure of the tubing itself. Meet J.I.C. requirements.

★ Easier and faster to install. Only an open wrench needed.

★ Can be used with practically any tubing, including heavy wall tubing that is difficult to flare.

IMPERIAL TOOLS . . . *do jobs better—faster*

HI-DUTY TUBE CUTTER. Has ball bearing action, flare cut-off groove in rollers. Retractable reamer. **No. 274-F** for 1/8" to 1" O.D. Tubing. **No. 312-F** for 1/4" to 1-3/8" O.D. **No. 206-F** for 3/4" to 2-1/4" O.D. Also **No. 384-F** Sawing Vise for tubing 3/16" to 1-1/2" O.D.

37° FLARING TOOLS for SAE 1010 soft steel and other metal tubing. Make flares to J.I.C. standards. Easy, single lever clamping. One compact tool, **No. 437-F,** flares six sizes — 3/16", 1/4", 5/16", 3/8", 1/2", 5/8" O.D. Tubing. **No. 537-F** flares 3/4", 7/8", 1", 1-1/4" O.D. Tubing.

UNIVERSAL GEAR-TYPE BENDERS. Will bend any type of tubing, including hard temper, heavy wall steel. Also pipe. High gear ratio makes bending easier. **No. 270-F.** Individual Benders for each size of tubing — 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1-1/8" O.D. Also lever-type benders.

THE IMPERIAL BRASS MFG. CO., 1242 W. Harrison St., Chicago 7, Illinois
In Canada: 334 Lauder Ave., Toronto, Ontario

Ask for Bulletin Set HC. See Your Distributor

IMPERIAL

Pioneers in Tube Fittings and Tubing Tools

you can
TRUST a
TROSTEL
seal

Leather
Oil Seals

Rigid laboratory control PLUS 100% inspection assures *Consistent Quality*

When the reputation of a product depends on the unfailing performance of a seal . . . you need *quality you can trust.*

Here, at Trostel, quality control procedures are an integral part of the packings specification itself . . . and these carefully worked out procedures are rigidly enforced during processing and manufacture by one or more of *three* separate laboratories. Then, to make doubly sure, each individual packing and oil seal must pass a comprehensive visual inspection before it can be released for shipment.

We invite you to join the growing list of major equipment manufacturers who know from their own experience:

"You can trust a Trostel seal."

Leather Packings

Synthetic
Rubber Packings

Synthetic
Rubber Oil Seals

Illustrated Bulletin On Request

ALBERT TROSTEL PACKINGS, LTD., Lake Geneva, Wis.

Formerly Division of Albert Trostel & Sons Co., Milwaukee, Wis.

BRANCH OFFICES
NEW YORK
LOS ANGELES
SAN FRANCISCO
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TROSTEL QUALITY

TROSTEL mechanical packings

1953 Directory Errata

While the errors in the 1953 Directory listings (January issue) were very few, we are sorry that even one occurred. There were some omissions because the Product Listings sheets were not returned or returned incomplete. The errors, either called to our attention or discovered too late to correct, are listed below.

Johns-Manville advises that, due to a misunderstanding, they should have been listed, in addition to the listings under which they now appear, under PACKINGS, Flange, Flexible Metallic, Gaskets, "O" Rings, "U" Rings, "V" Rings, Washers and Wiper Rings.

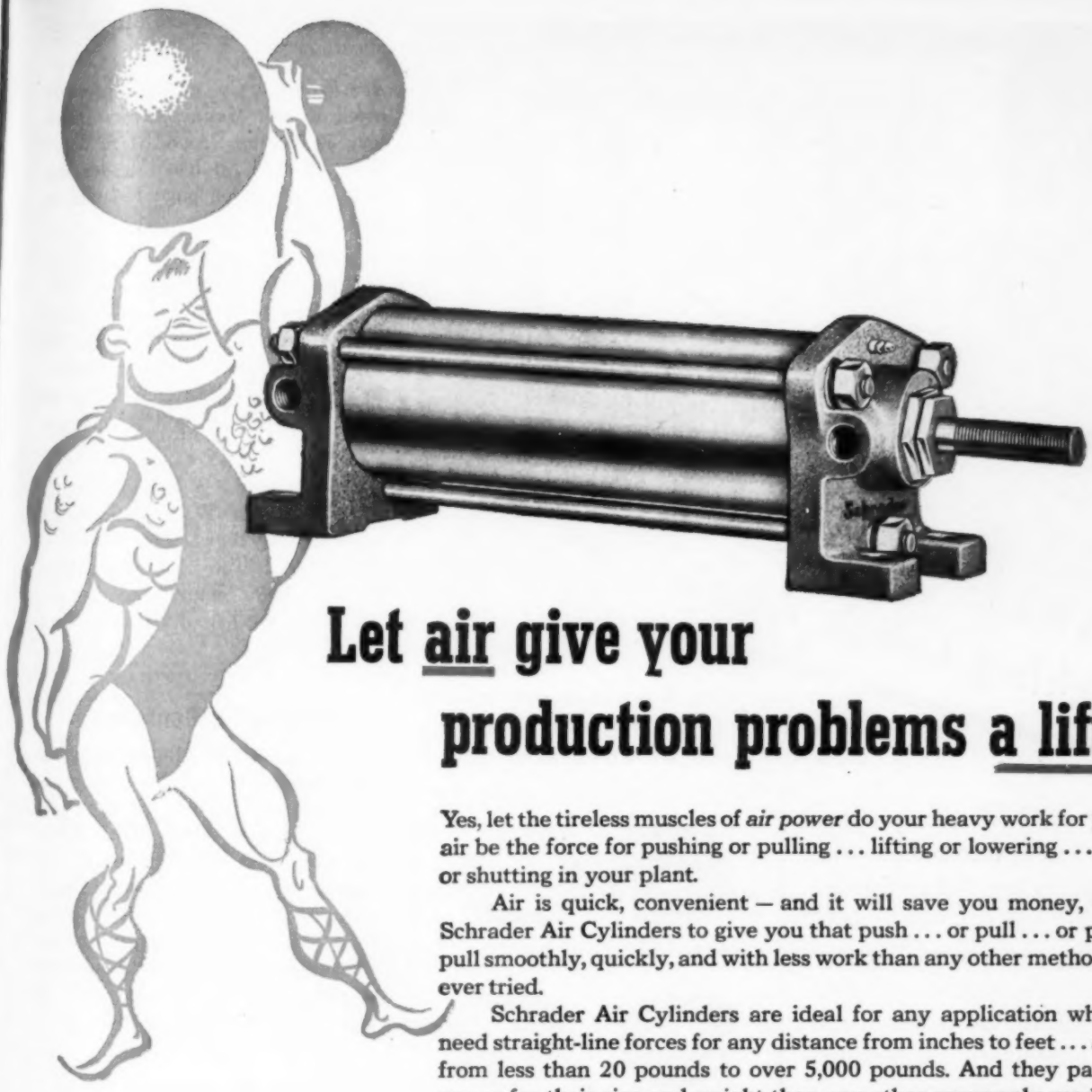
Alten Foundry and Machine Works, Inc., properly listed under PUMPS, OIL-HYDRAULIC, Hand, were omitted in the Manuacturers' Directory section.

Minnesota Rubber & Gasket Company writes us that they were not listed under PACKINGS in the Aircraft Products section and that they should also have been listed under COUPLINGS in the Industrial Products section for COUPLINGS, Air, Self Sealing, Quick Disconnect; Oil, Self Sealing, Quick Disconnect; and Swivel.

Powers Regulator Company advises us that their new address, changed while the Directory was in process, is 3400 Oakton St., Skokie, Ill. They are listed under VALVES, Temperature Control for Oil.

Reavel & Company Ltd. (English Manufacturers list) informs us that the listings COMPRESSORS, PRESSURE SWITCHES and AIRCRAFT COMPRESSORS do not give a true picture of their products which include Reciprocating, Rotary and Turbo Compressors for air and other gases, Air Motors, water lubricated and non-lubricated Cylinders and auxiliary equipment such as Intercoolers, Aftercoolers, Pressure Gauges, etc.

The Deutsch Company, 7000 Avalon Boulevard, Los Angeles 3, California, should be added to the Manufacturers and Products Directory. This company makes FITTINGS,



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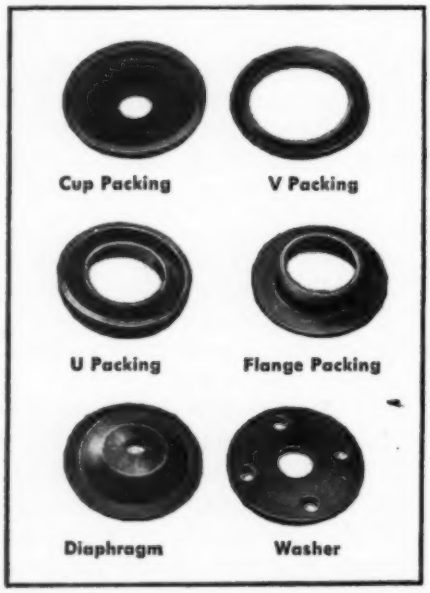

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Tube for industrial and aircraft applications.

Ace Products Co. who are properly listed in the Manufacturers Directory as making PACKINGS, Wiper Rings should be listed under this product group on page 164 and on page 216.

Aerolab Development Company, 330 W. Holly St., Pasadena 3, Calif., manufactures a high speed pump test drive, qualifying them for listing under Test, Stands, Hydraulic in the Aviation Section. The record was received too late for regular listing.

Rhodes, Brydon & Youatt Ltd., 28 Victoria St., S. W. 1, London, advises us that they are specialists in the manufacture of centrifugal pumps. Their name was not included in the list of English manufacturers.

Packaging Conference

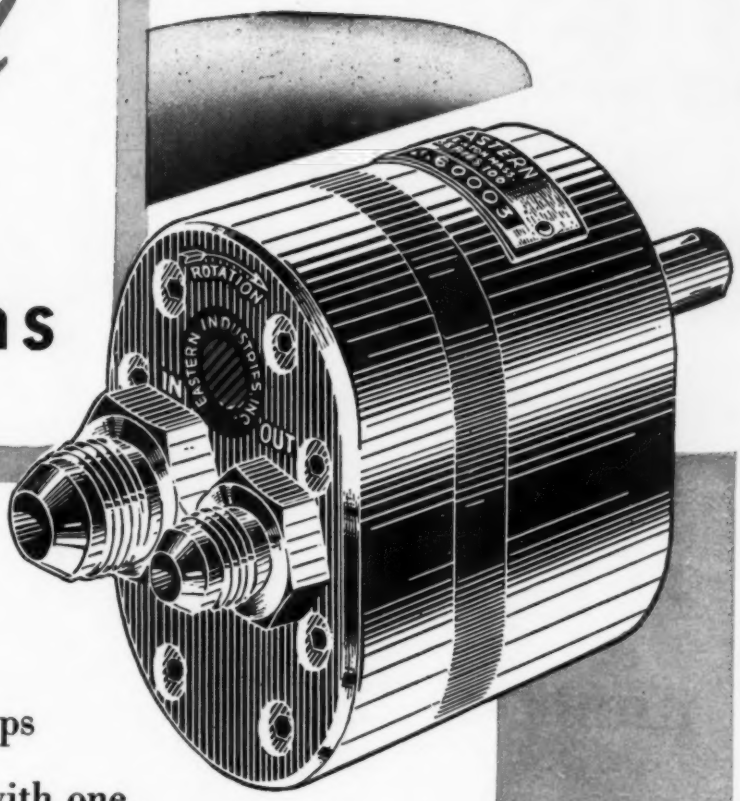
The American Management Association's National Packaging Exposition will be held on the Navy Pier, Chicago, April 20-23. Over 300 exhibitors will show machinery, equipment, materials and services. Concurrently the Packaging Conference will highlight major changes in simpler and faster machinery, applications of materials and improved production methods.

Flodar Corporation Holds Annual Sales Meeting

Flodar Corporation held their annual sales meeting for their dealers on Tuesday, March 10 at the Allerton Hotel, Cleveland. Matt Bauer, vice president and general manager, welcomed the 24 dealers, who came from as far as Boston and Los Angeles. In addition to the sales meeting, a visit to Flodar's new plant was made.

Bauer announced the appointment of M. O. Cox as chief sales engineer. Cox reviewed the new products, first announced at the meeting. Max Hillmann of Cox Engineering and Sales Co., Detroit, was awarded a gold watch by the company for his successful efforts in placing Flodar fittings as standard equipment in all Pontiac plants. Mrs. Marie K. Bauer, office manager, made the presentation.

Designed for your applications

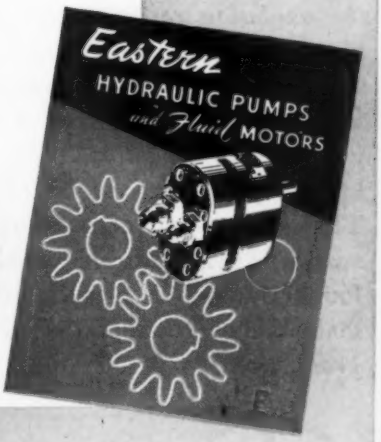


Eastern's line of hydraulic pumps and fluid motors are designed with one objective in mind: *to supply an economical, reliable and compact unit for the heart of your hydraulic mechanism.*

You will find a combination of exclusive features in Eastern products which will make your selection a confident one.

HYDRAULIC PUMPS FLUID MOTORS

Send for Eastern's brand new Hydraulic Catalog C-800. Contains valuable engineering diagrams and information.



Eastern INDUSTRIES INCORPORATED
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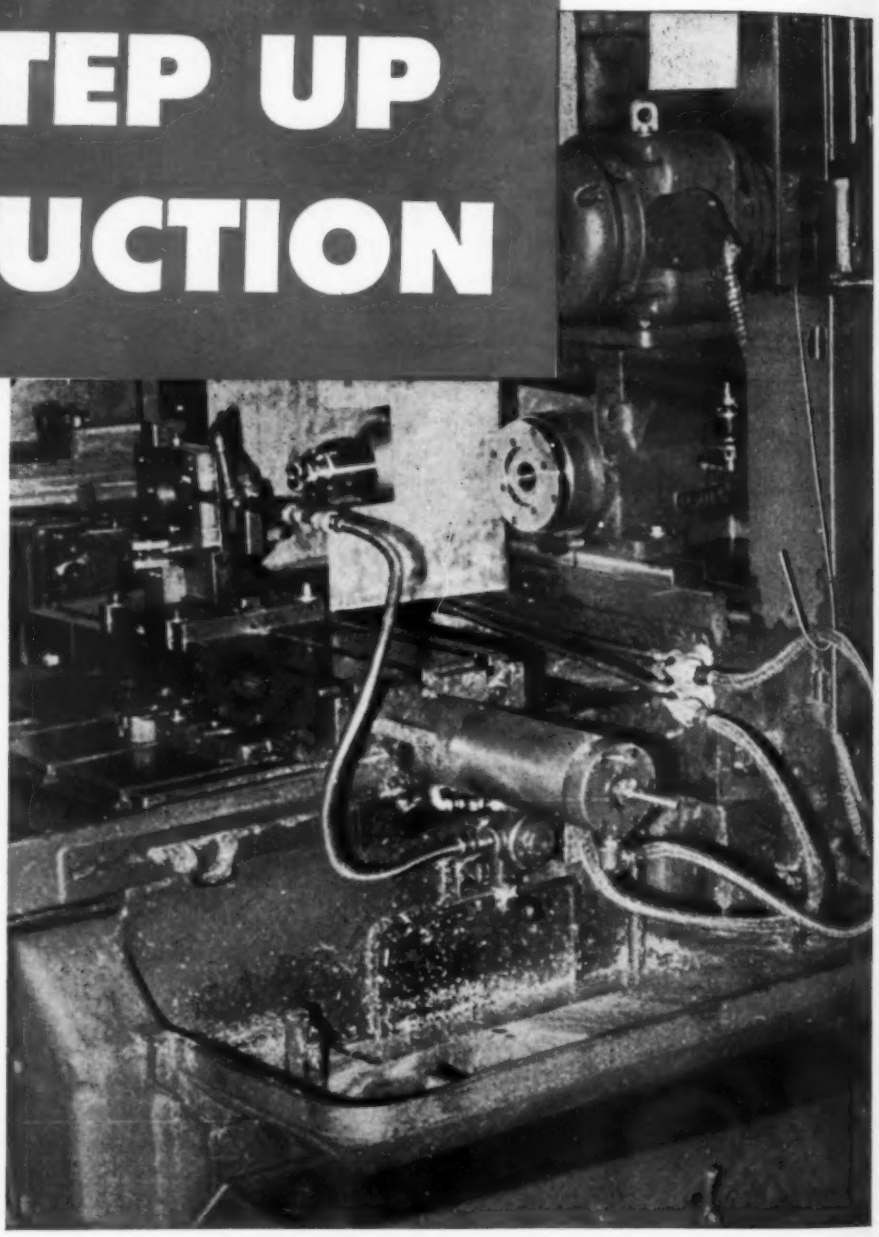
A SIMPLE RULE TO STEP UP PRODUCTION



Even when you have to keep your hydraulic machines working around the clock, you can avoid unscheduled stoppages by following this simple rule: Use *Texaco Regal Oil (R & O)* as your hydraulic medium.

Texaco Regal Oil (R & O) is the famous turbine-quality oil that tests show has *more than ten times the oxidation resistance* of ordinary turbine-quality oils — much stronger rust-inhibiting ability and freedom from foaming. That's why *Texaco Regal Oil (R & O)* keeps hydraulic systems clean. That's why you can count on smoother hydraulic motion, longer pump and parts life, lower maintenance costs and — *greater production!*

There is a complete line of *Texaco Regal Oils (R & O)* for every size and type hydraulic unit. All are approved by leading hydraulic manufacturers.

Let a Texaco Lubrication Engineer help you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

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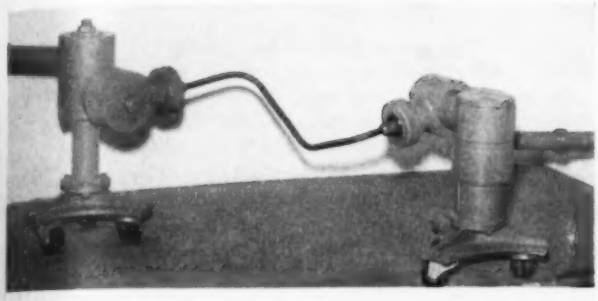
FOR ALL HYDRAULIC UNITS

TUNE IN: Tuesday nights on television—the TEXACO STAR THEATER starring MILTON BERLE. See newspaper for time and station.



Design of caster mounted, swivel jointed fixtures simplifies pressure and flow testing of formed tubing

Air Actuated INTENSIFIER CIRCUIT Provides Explosion-Proof Test Stand

By Edward F. Paulus

ONE of the major builders of engines for jet aircraft was faced with the problem of pressure testing formed runs of tubing, partial and complete assemblies as well as hose and hose assemblies. Several problems confronted the builders of a test stand for this application. First, universal fixtures which could be quickly positioned to accommodate any tubing configuration had to be developed. Second, because the testing fluid is a highly volatile cleaning agent, equipment on the stand had to be explosion-proof. Third, pressures up to 10,000 psi had to be available.

Setting about to solve these problems, the engineers at Air Hydraulic Products Company developed an air powered intensifier circuit which uses an air motor to power the pump and air to pilot operate the control valves. The only electrical connections is to a light bulb above the safety glass covered test area.

Much work was put into the development of a universal fixture. Each caster mounted fixture has four swivel joints which permit moving the fixture in any desired position. Quick connect-disconnect fittings to handle tubing diameters from ¼ inch to 1¼ inch diameter can be quickly fitted into the fixtures. As seen in the photographs, the design of the fixtures is very compact, leaving the working area open to make loading and unloading of work a very convenient operation. Swivel joint design uses closely fitted bushings mounted on thrust bearings. The joints are properly sealed to minimize leakage. When pressure is applied to the fixture it locks itself in the set position keeping the tubing from deforming.

Pumps Low Viscosity Fluid

A cleaning agent is used as the pressure medium so that the parts which are tested do not have to be cleaned before storage or assembly. Because this very light, low viscosity fluid is difficult to hold in a system, the circuit was designed to contain the fluid

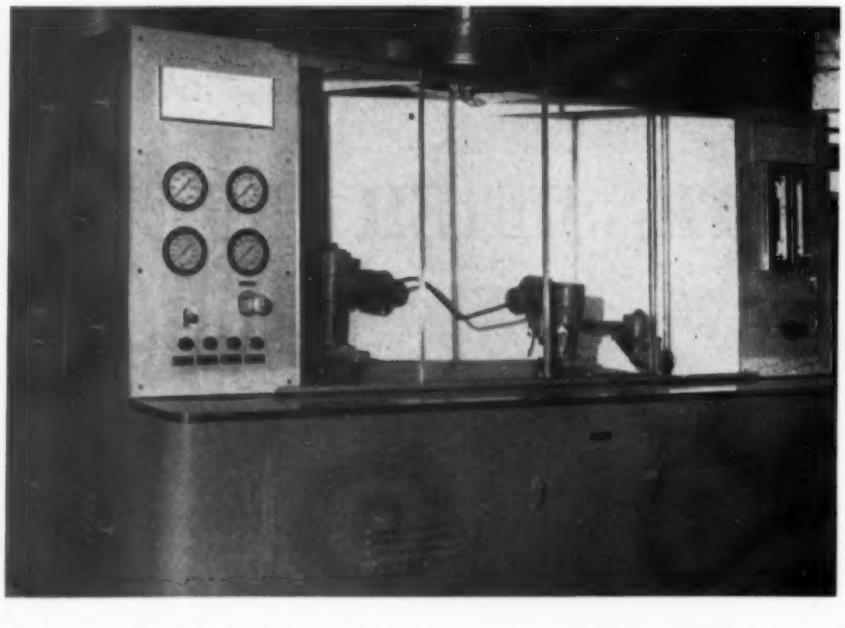
EDWARD F. PAULUS, Air Hydraulic Products Company, Centerline, Michigan.

. . . four intensifiers provide pressures up to 10,000 psi . . . air motor driven pump prefills the system with the pressure fluid

in a minimum number of lines.

From the tank, the fluid is pumped at under 50 psi to fill the work piece held between the fixture heads and to fill the small bore of the intensifiers. When these lines are filled with fluid, the pump motor is automatically stopped, and air enters the intensifiers to build up fluid pressure in the fixture. High pressure fluid is trapped between check valves.

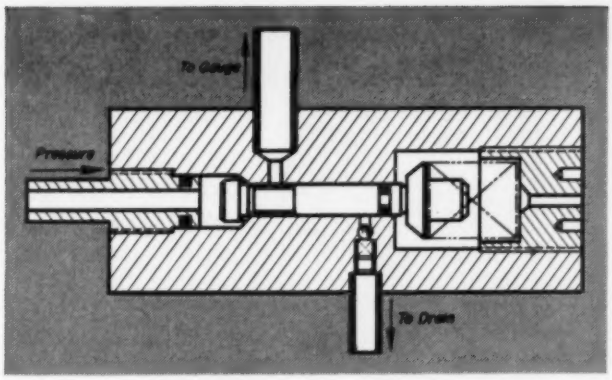
To provide the desired test pressures, four intensifiers are used on this stand. Pressure ranges are 50-160



MOVING ONE valve lever on the left side of the stand starts the pressure test cycle. Each of the four pressure gauges is connected to an intensifier. The four knobs at the bottom are selector valves to pick the pressure range. Air pressure to the intensifiers is regulated by the large knob. Flow meters on the right side are controlled by the valve handle on the panel. The light bulb is the only electrical component on the stand.

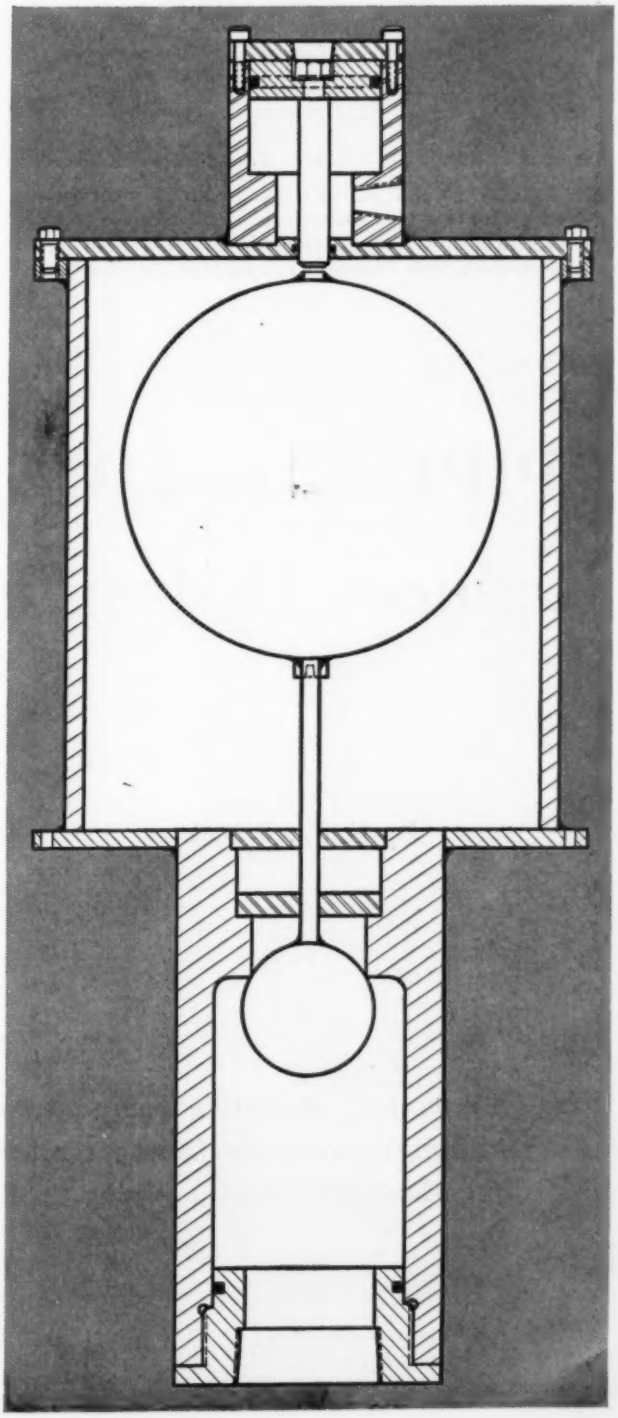
LOW PRESSURE fluid is supplied by a vane pump to the small bore of the four intensifiers. The pump, mounted on the fluid reservoir, is driven by an air motor. Air pressure to the intensifiers is controlled by the regulator seen in the top piping run. Control valves to the intensifier are pilot operated with air pressure.

WITH THE PANEL removed from the left side, you see the large float check valve and the specially designed gauge cutoff valves. The large pipe line carries fluid from the float valve to the flow meter. Air pressure to the pilot operated on-off valves for the air motor is regulated by the filter-lubricator-regulator unit.



GAUGE CUTOFF valve has a spring adjustment to regulate the pressure at which the spool will shift to close off the gauge from further pressure build-up. The small check valve provides a bleed off path for air and fluid leakage around the spool.

WHEN FLUID has filled the intensifier and the work piece, increased fluid flow raises this float valve to close off flow and build up pressure to operate a pump shutoff valve. A small air operated "kicker" cylinder on top of the float valve holds the check open during flow tests and insures opening of the float valve after the pressure test.



psi, 160-640 psi, 640-2500 psi and 2500-10,000 psi. Operating range is selected by manual operation of one of four valve handles on the front of the test stand. An air pressure regulator knob on the front of the panel is used to vary the pressure over each of the four ranges.

While the part is in the fixture, a flow test can be run to check for any obstruction in the tubing. Manual actuation of one valve opens a pilot operated float valve and starts the air motor which drives the pump. Fluid from the pump now passes freely through the fixtures and the open float check valve to the flow meters and back to tank.

As a further safety precaution a CO_2 fire extinguishing system which operates automatically or manually is an integral part of the stand.

Air Motor Drives Pump

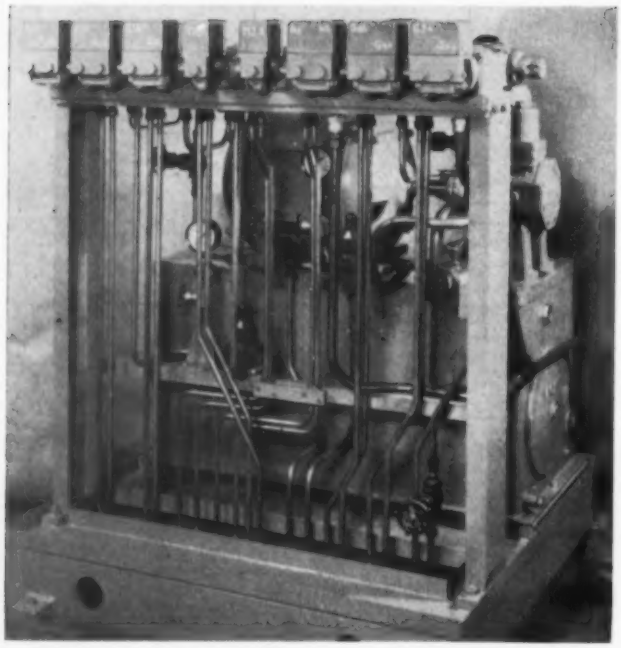
The circuit uses standard air components and a vane type pump. Pump rotation speed and delivery is controlled by the air motor. Using shop air at approximately 80 psi, the air motor rotates the pump at about 200 rpm giving a pump output of about 50 gpm at 50 psi.

Two special valves were developed for this circuit. One is an adaptation of a gauge cutoff valve which protects the pressure gauge from excessive fluid pressures. A hole was drilled in the valve housing and a light spring check was put in to act as a bleedoff for air and any leakage past the valve spool.

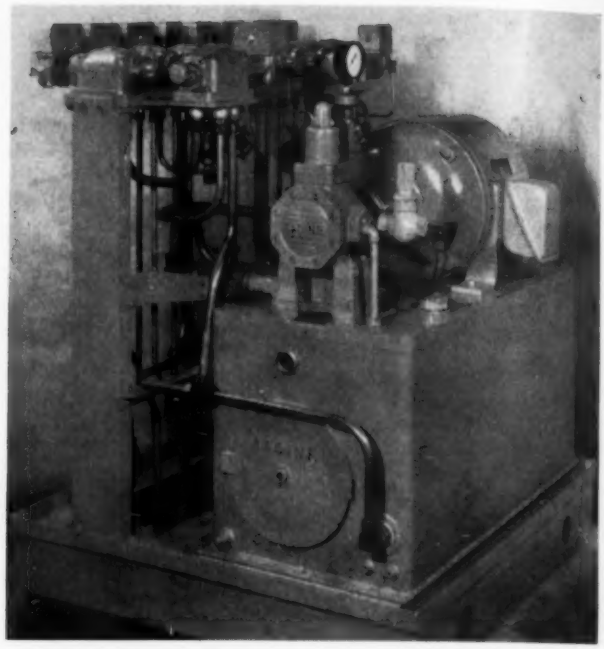
Float Check Valve Bleeds Air

The float check valve placed in the highest point of the circuit bleeds air out of the system. Actuation of a small pilot cylinder above the float ball holds the check valve open during flow tests and prevents the valve from sticking shut.

Development of this air powered test stand has emphasized simplicity of control and operation, safety to equipment and operator and accessibility for service.



SPECIALLY BUILT power package supplies oil to nine cylinder and fluid motor operated devices on a wheel turning machine. Valves are gasket mounted on top of the manifold. One common return line and three pressure lines are piped to the exhaust and pressure passages in the manifold. Vertical lines from the manifold drop to a header in the bottom of the unit. Connections to the cylinders and motors are made to this header.



PIPING and MANIFOLD LAYOUT Reduces Hydraulic Maintenance Costs

By E. W. Friedl

Rigidly mounted, accessible components result in longer, more satisfactory service life. Manifolds reduce piping.

PROPER arrangement of components is very important if a hydraulic system is to perform satisfactorily. It is not enough to select the proper valves and pumping unit and then to sketch a schematic to show how these parts are connected. The best components and the cleverest circuit will not function very long if valves vibrate, fittings loosen and the system leaks.

Careful layout, on the drawing board, of the hydraulic system illustrated here, has simplified initial construction and will also save many man hours of maintenance time.

This power package, built to supply pressure oil to eight cylinders and two fluid motors on a wheel turning machine is separate from the machine. Having a separate unit has the advantage of isolating the construction. The designer has no temptation to hang

E. W. FRIEDL, Design Engineer, Precision Products Inc., Cleveland, Ohio.

. . . machine design and maintenance is simplified by building the power package separate from the machine

valves on any machine member or to hide the oil reservoir in a machine base. The benefits of accessibility are readily apparent.

Because leakage is a function of the number of fittings, the tubing layout was made to keep the number of fittings to a minimum. Further, a welded manifold was designed to eliminate many connections. The photographs of the power unit illustrate the liberal radii used in forming the tubing and show the care taken to allow sufficient space for assembly.

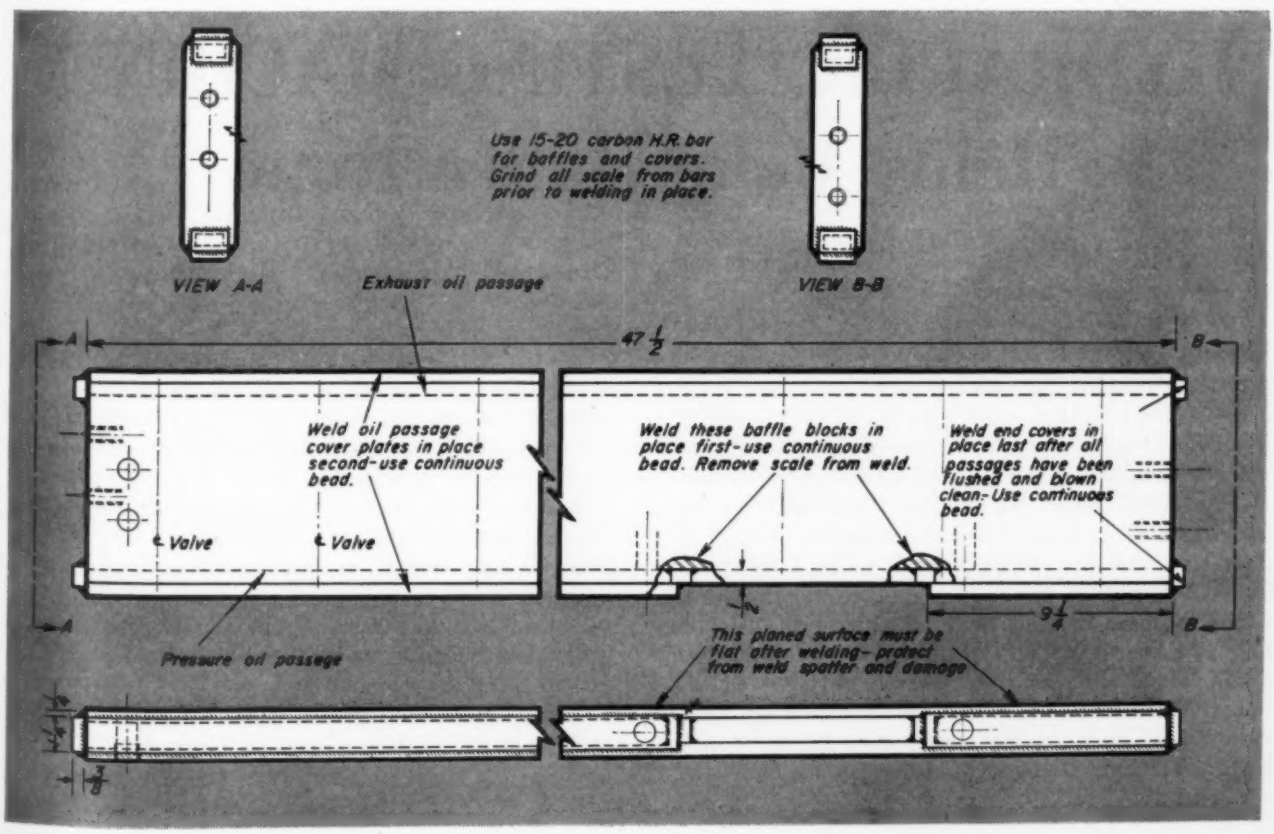
Another cause which is high on the list of hydraulic system headaches is high operating temperature of the oil. The use of 5/8, 3/4 and 1 inch O.D. tubing with large bend radii prevents temperature rise caused by restricted flow and sharp bends. Rapid heat dissipation is made possible by the open construction. System pressure is relieved through a tandem-neutral control valve to prevent excessive heat generation during the idle phase of the machine cycle.

Solenoid controlled-pilot operated directional control valves are gasket mounted on top of the 2⅛ inch thick manifold. Construction of the weldment is shown in the accompanying drawing. The top surface of the manifold is ground flat and port holes for the valves are drilled and tapped using a simple drill jig. Welded plates seal off the exhaust and pressure channels which run the length on each side of the manifold. Drilled holes, 3/4 inch diameter, connect the valve ports with these passages.

A 20 gpm, pressure compensated, variable delivery, vane type pump, driven by a 15 hp 1200 rpm electric motor, is mounted on the 80 gallon oil reservoir. Filtration of the oil is through an all metal edge filtration type unit which is mounted outside the tank in the suction line from the tank to the pump. Periodically turning a handle on top of the filter frees the filtering surface of all solids to restore initial conditions of flow without interruption of service.

Three different oil pressures must be supplied by this unit. At full load, the pump will supply 900 psi oil to 6 of the actuating devices. Pressure reducing valves reduce line pressure to 800 psi for one cylinder and 350 psi for two others. This requires three pressure lines to the manifold which has the pressure passage divided into three sections by small blocks welded in place.

THE MANIFOLD WELDMENT has a main 2⅛x7½x47½ inch plate with an exhaust and pressure passage milled along opposite sides and drilled holes from these passages to valve port holes. Cover plates are welded over the passages. All welds are continuous and checked for leakage at 1500 psi pressure. Spacer blocks in the pressure passage separate the three different operating pressures.


Use 15-20 carbon H.R. bar for baffles and covers. Grind all scale from bars prior to welding in place.
VIEW A-A
Exhaust oil passage
VIEW B-B
47 1/2
A
B
Weld oil passage cover plates in place second-use continuous bead.
Weld these baffle blocks in place first-use continuous bead. Remove scale from weld.
Weld end covers in place last after all passages have been flushed and blown clean-Use continuous bead.
Valve
Valve
9 1/4
Pressure oil passage
This planed surface must be flat after welding- protect from weld spatter and damage

TENSILE TESTS, ELONGATION MEASUREMENTS and the preparation of weight samples are several functions of this rope testing machine.

HYDRAULIC TESTING MACHINE Helps Make Better Rope

ROPEMAKING, an ancient craft that can trace its roots to the stone age, is today a modern process calling for precision engineering methods and in the laboratory of the Plymouth Cordage Company in Plymouth, Mass., an unusual hydraulic testing machine is continually kept busy snapping lengths of giant rope that are strong enough to hold the S. S. United States to a pier.

The machine is used by Plymouth to insure that all rope that leaves its plant measures up to published specifications and also for research purposes in the continual search for ways to make rope even stronger.

Especially designed for rope testing by the Riehle Testing Machine Division of American Machine and Metals, Inc., the machine has been performing its yeoman task at Plymouth for eleven years and, at the end of that period, it still calibrated to within ½ of 1% of recorded load.

Testing tensile strength is only one of the uses to which Plymouth puts the machine. It is also used to determine the elongation characteristics of rope under repeated loadings and in the preparation of weight samples which, in order to insure industry-wide standardization, must be cut while the rope is under a load of 200 times its diameter squared.

The machine itself, which will test tensile strengths as high as 120,000 lbs., is not the largest machine in

Concluded on page 80

ELECTRONIC INSTRUMENTATION

. . . techniques for hydraulic application

By H. L. Kressin

HOW often have you wanted to obtain a measurement of that unknown quantity? Most engineers feel that if they could only measure all of the troublesome parameters in their hydraulic circuit, they could establish a better basis for a redesign or a repair job. Fortunately some of these things can be measured, not with specialized equipment, but with commercial equipment. This has been the result of a long learning process, experience, and an acceptance of the help that the associated field of electronic measurement can offer. We have learned to rely on electronics in solving our many measurement problems, with remarkable results in terms of accuracy, ease of reading, and interpretation of these readings into usable data.

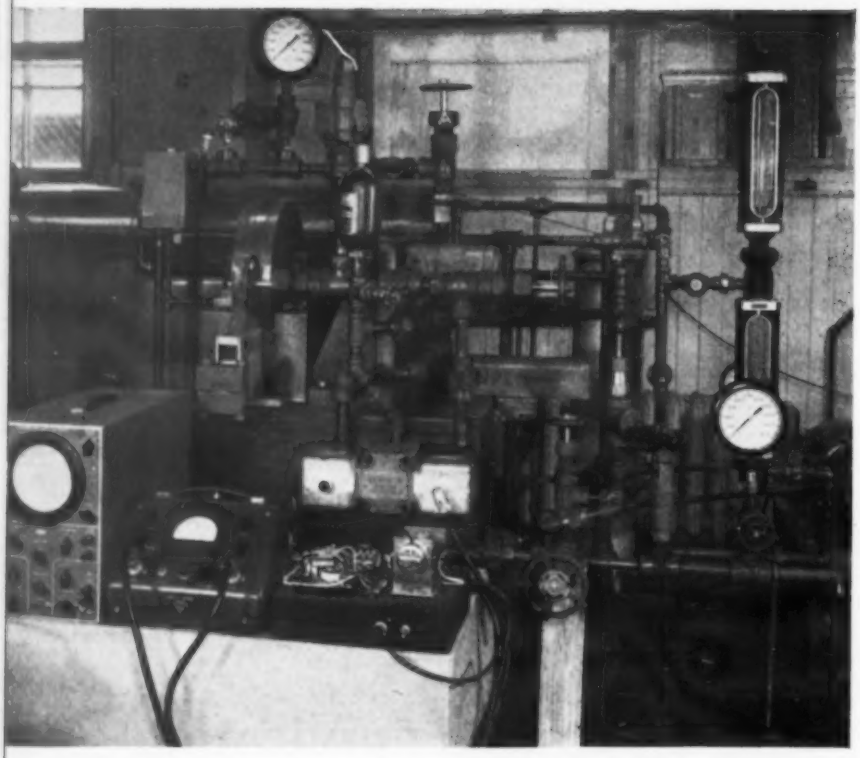
A laboratory or shop containing an array of diversified measurement, recording and control devices, which can be used to accomplish many functions, can become the heart of an industrial plant. This laboratory, however, need not consist of many different types of instruments; a few, well chosen can be used for the several different parameters to be measured.

Here is what I believe are the important aims of an instrumentation laboratory for designers and users of hydraulic equipment. This laboratory should be able to measure and record temperature, static and dynamic or surge pressures, flow, vibration, speed and torque. Its equipment should be easily adapted to the measurement of several different parameters. The accuracy of this equipment should be within 2 percent. Above all, it should be dependable or constructed in such a manner that it can be easily serviced. Before purchasing equipment, it should be decided whether it is readily adaptable to your measurement requirements over a long term. The electronic equipment should also be drift proof, or have a means of determining the drift, and provision for resetting or adjusting for this drift or change in output.

Instrumentation Groups

In the field of commercial electronic or electrical instrumentation, the forerunners were the manufacturers of temperature measuring and recording devices. In the last twenty years there have followed electrical devices for measuring forces. Considerable

H. L. KRESSIN, The Franklin Institute of the State of Pennsylvania, Philadelphia, Pennsylvania



A SIMPLE PRESSURE gage having a differential transformer is used on this hydraulic motor test to determine amplitude and wave form of the high, approximately 4000 psi, activating and retarding pressures. It is also used to examine the amplitude of a decompression wave which was causing failure of a low pressure exhaust line. This pickup is designed for 7000 psi operation, but was also found to be useful for measuring pressures of 100 to 300 psi.

emphasis has also been placed on torque, fluid flow, vibration, and motion-measuring devices. It is generally accepted that these parameters fall in a single instrumentation group. Two well defined methods of measuring these parameters have been developed; one uses the strain-sensitive gage, and the other uses a displacement or motion-sensitive differential transformer. Various means have been devised for converting displacements or motions into an electrical signal, but only in the last five years have instrument manufacturers been able to develop a linear and stable system for applying the differential transformer as the transducer. This second system, which will measure substantially linear motions, is an important tool in the science of electrical instrumentation. For example, the displacement of a diaphragm or bellows can be measured and a linear relation can be established for the pressure in the system under test.

Strain Gage Equipment

Strain gages fall into two definite categories. One is the bonded-wire strain gage; the other is the unbonded type. They operate on the principle of electrical resistance change per unit change of strain. This strain can be related to a force reading. The bonded-type strain gage can be cemented to any type of smooth surface, flat or curved. Gages are now being made, which will measure strain or stress in structures that are subjected to temperatures in the range of 45 to 1600 degrees F. Initial cost is in their favor. The unbonded-type gage consists of a frame, which supports a movable armature by two thin cantilever plates. Four sets of constantan filaments are strung under initial tension between the frame and the armature. When the armature is displaced in the longitudinal direction by the action of a bellows or diaphragm, two sets of these filaments are elongated, while two sets are shortened. The change of resistance of these filaments will be proportional to their change in length. Each filament thus becomes a leg in a Wheatstone bridge circuit. The unbonded gage requires a high degree of precision in its manufacture. It is not as versatile as the bonded gage, but it is a good "shelf item" that can be put to use with a minimum amount of expense.

Determining Gage Factor

In the resistance-type strain gage, the load-resistance properties of a single strand of wire is used as a strain measuring device. It is possible to use a strain gage with no accessories other than a battery and a highly sensitive measuring device. Owing to the normally high resistance of the gage, 120 ohm to 1000 ohm, it is almost impossible to determine the slight change of resistance that occurs for a unit of force. This difficulty has been overcome by using a standard Wheatstone bridge circuit as the basic measurement circuit. In a balanced Wheatstone bridge circuit, the total strain gage resistance is canceled out. Strain gage manufacturers have made instrumentation easy for us by supplying with their gages a gage constant, or factor, that relates the change in resistance caused

by a unit of strain to the total resistance of the gage. In simple terms,

$$\text{Gage Factor} = f_g = \frac{R_c/R_g}{E},$$

where R_c is the change of resistance
R_g is the gage resistance
and E is the unit strain

It is noted again that a single Wheatstone bridge is suited for measuring static strains because it can be adjusted to a null balance. If the bridge is balanced at a condition of zero strain or force, and if a strain is then applied to a strain gage which forms what is commonly termed the "active leg", the voltage at the output terminals can be evaluated by the following relationship when a DC voltage is applied to the bridge circuit.

$$E_o = 1/4\ E_B f_g E n$$

where E_B is the bridge voltage
f_g is the gage factor
E is the unit strain (micro-inch/in)
and n is the number of active gages.

Figure 1 shows a typical bridge circuit when a single active gage is used.

The strain indicator shown in the circuit diagram may be a sensitive galvanometer-type potentiometer,

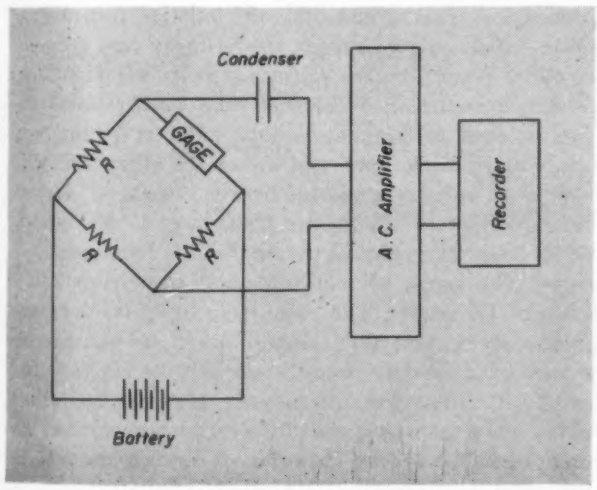


FIG. 1. TYPICAL bridge circuit using a single active strain gage.

commonly used for temperature measurements, or a microammeter. When a microammeter or galvanometer is used for measurement of a given strain, the current may be calculated by the following formula.

$$I = \frac{E_B f_g n E}{4(R + r)} \text{ microamperes}$$

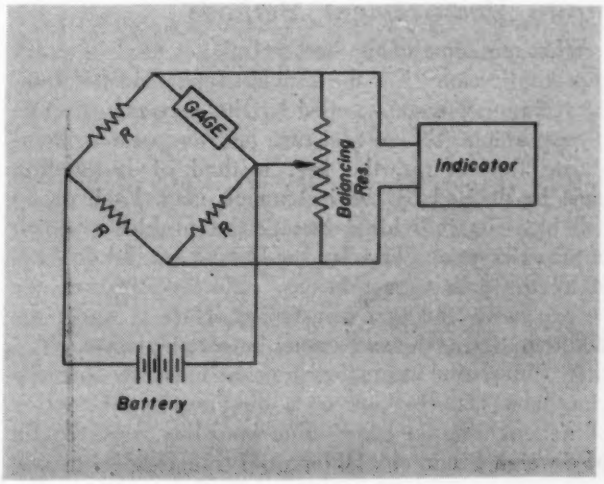
where E is the strain (micro-inches per inch)
f_g gage factor
n is the number of active gages
R is the gage resistance
r is the resistance of the microammeter
E_B is the bridge voltage

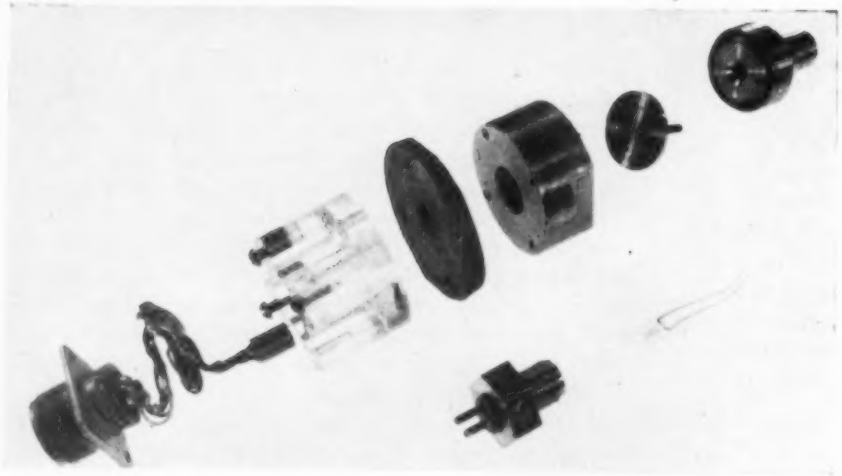
Along with the strain gage, its manufacturer also markets a strain indicator for field and laboratory measurements. It is a complete unit with bridge, battery, and indicator. It is only necessary to wire the active gage and one compensating gage to the instrument. Operation is normally quite simple, and strain values are merely read from the meter. Their use, however, is restricted to the measurement of static phenomena. When vibratory or surge conditions are to be measured, the measuring equipment must be capable of following the signal generated by the transducer. The simple strain gage indicator, the DC millivolt meter, the microammeter, or the galvanometer-type potentiometer can no longer be used. The electronics experts have contributed greatly in making this type of measurement. Packaged units are now available, which can be used for both static and dynamic measurements. These units are comparatively drift-free, and are designed to be used with a cathode-ray oscilloscope as the recording or indicating component. This equipment can be used for the range of frequencies from DC to a frequency of 25,000 cps, which is well above those frequencies encountered when pure shock is being measured. Records of oscilloscope traces are easily made with a simple still camera.

Pure Dynamic Measurements

When pure dynamic phenomena are to be measured, that is, when the static component can be neglected, a very simple electrical system can be established (Figure 2). The balancing resistors shown in previous diagrams are no longer needed. These resistors are replaced by a condenser in the amplifier input circuit. This condenser blocks the DC output of the bridge circuit. The troublesome DC amplifier is replaced with a drift-free, AC amplifier. The recording instrument

FIG. 2. BRIDGE circuit measures pure dynamic phenomena.





EXPLODED VIEW of the differential transformer gage. A high pressure flush diaphrage pickup with a strain gage as the electrical sensing device is also shown.

can be a cathode-ray oscilloscope or a galvanometer-type recording oscillograph.

Calibration of the dynamic system is usually accomplished by obtaining a voltage-strain ratio or voltage-pressure ratio for the bridge circuit separately, and then obtaining the relationship of a known AC input voltage to the record amplitude for the amplifier-recorder system. A typical grouped relationship is the following

$$E = \frac{\sqrt{2}(4)}{E_B f_g} \quad \frac{\text{(E in Calib)}\ \text{(Record Amplitude Test)}}{\text{(Record Amplitude Calib)}}$$

It should be pointed out that when equipment other than properly designed commercial items are to be used, care must be taken to place both output leads of the bridge circuit above ground. If one side of the amplifier input circuit is at ground potential, one complete leg of the bridge circuit will be shorted out. This usually can be avoided by placing an isolation transformer between the 110 volt AC line and the amplifier.

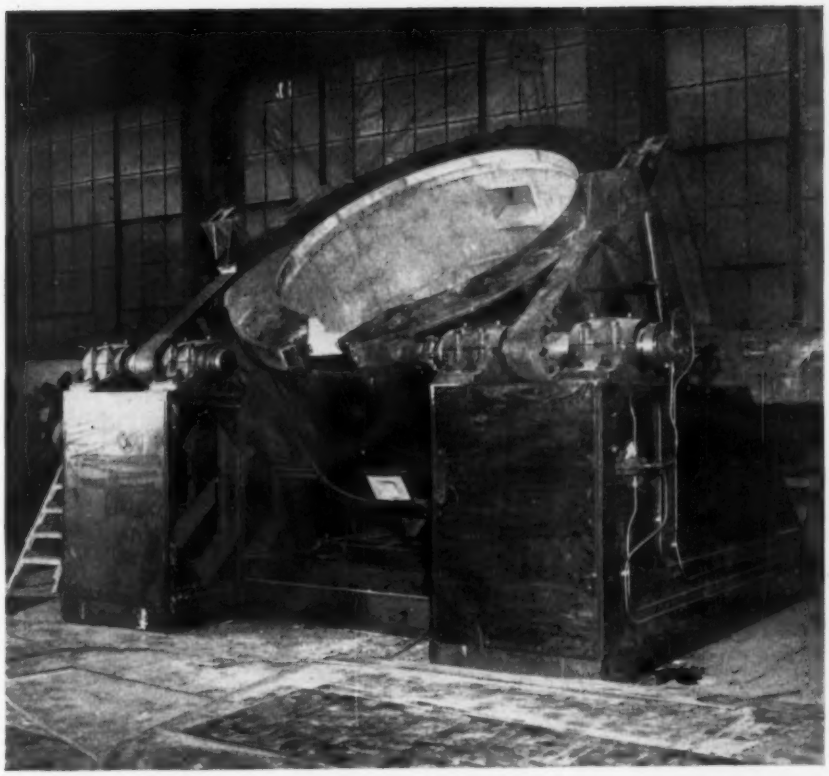
Strain Measurement Methods

What are some of the best techniques used in strain gage application? For the simplest type of installation, the techniques recommended by the gage manufacturers are ample. Where moisture and temperature complicate the set-ups, the best method of installation must be devised by the instrument man. Each set-up will have its individual installation problems, which in many cases can be solved only by a careful analysis of all the existing conditions. This investigation can be expensive and time consuming. Here is where the differential transformer comes into the picture.

A differential transformer can measure the displacement of a bellows or a diaphragm, the motion of a float, the tip travel of a bourdon tube, the tilt of a weigh beam, etc. Differential transformers consist essentially of a primary coil, two secondary coils and an armature of magnetic material. The primary coil is energized from a suitable source of alternating current. The two secondary coils are connected so that their outputs are 180° out of phase. And the armature is located so that it can alter the relative flux distribution which exists between the primary and secondary coils. When the two secondary coils are identical, and the armature is located so that each receive an equal amount of flux, the voltage induced by the two coils will be zero. Any motion of the armature will result in an unbalance voltage between two secondaries. The sensitivity of this type of transducer is very good, and its linearity is almost perfect for the recommended ranges. The range of motion now covers from 0.010 inches to 1.0 inches. The manufacturer of these transformers states that they should never be considered as part of a bridge circuit, but only as an isolated source of controlled alternating current. In other words, when applying the differential transformer to a measuring problem, a null-type circuit is recommended.

A null circuit, however, is not suitable for obtaining general laboratory measurements. The two secondary coils of the transformer can be used as two legs of a bridge circuit. The bridge circuit, instead of having four resistive legs, will have two inductive legs and two resistance legs. This bridge circuit can then be used in the same manner as the strain gage bridge. It is recommended that the complete transducer, amplifier, and recorder system be calibrated as a unit. That is, a relationship between the motion under test and the recorder amplitude be established. In general, differential transformer instrument systems can be used where highly accurate measurements of motions are required, and where only minute forces are available and friction of any kind would be a disadvantage.

READY FOR final cleaning and finishing before shipment, this melting pot uses a manual control valve on the side to control the tilting cylinders. On the right end of the fulcrum shaft is a cam control valve for slowing rapid return.



OIL DRIVEN TILTING MECHANISM

pours 25000 pounds of molten metal

Designers of tilting type melting pot furnaces choose oil power to position the pot because of the fine, quick control available with a minimum of operator effort. This 25,000 pound hydraulic tilting melting pot furnace, designed and built by Bellevue Industrial Furnace Company of Detroit, is used for Kirksite metal.

The furnace and pot are tilted by two 54 inch stroke cylinders, one on each side of the pot. Each cylinder has a diameter of six inches keeping the required oil pressure at a low 750 psi to lift the pot and its metal charge.

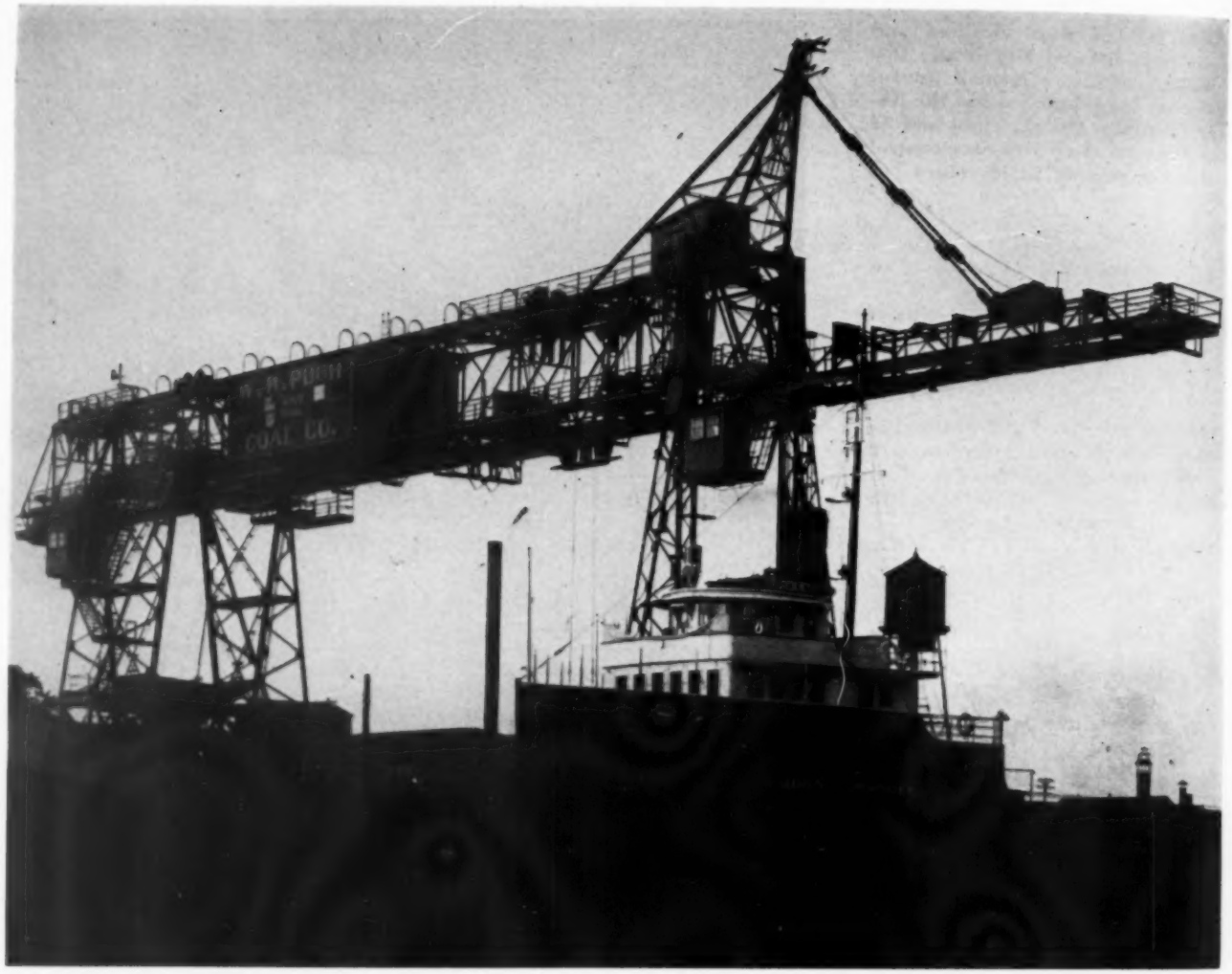
Control of tilting speed is most important from the standpoint of safety as well as operating efficiency in filling molds. To provide this control, adjustable flow control valves are installed in both the forward and return lines of each cylinder. The return stroke has a double control:

1. A cam actuated flow control valve, moved by the rotation of the furnace fulcrum shaft allows a limited rapid return to stop the pouring of the metal.
2. A flow control valve for the remainder of the return stroke to cushion the furnace into return position. Once set the flow control valves function automatically.

The operator uses only one lever handle control valve to initiate up or down motion of the 76 inch diameter, 37 inch deep pot.

On almost all furnace pots of weight requiring power tilting, hydraulic systems are being used. Electrical hoist tilting has proved inadequate because of poor speed control as well as cost, lack of flexibility of operation and simplicity of design.

By careful design, the use of an oil system on these furnaces does not create a fire hazard. Formed tubing keeps the number of fittings to a minimum. Low pressure operation also minimizes the possibility of leakage in this hot area.



BRAKING FORCE of the unloading bucket on this gantry is applied by a hydraulically assisted system.

HYDRAULIC ASSIST On Gantry Crane Reduces Operator Fatigue

By J. H. McCormick and Joel Roberts

BY including a hydraulic system to do the hard work of moving brakes and clutches, it is possible to rebuild many cranes to give years of more efficient operation. That's what the management of the W. H. Pugh Coal Co. in Racine, Wisconsin decided to do three years ago to the gantry crane on their Lake Michigan docks.

On the original crane, the brakes and clutches were controlled by lever actuated cables. The operating load

J. H. McCORMICK, Sales Engineer, J. M. Grimstad, Milwaukee
JOEL ROBERTS, W. H. Pugh Co., Racine, Wisconsin

. . . manually controlled slowdown gives necessary "feel" and oil power applies final brake force

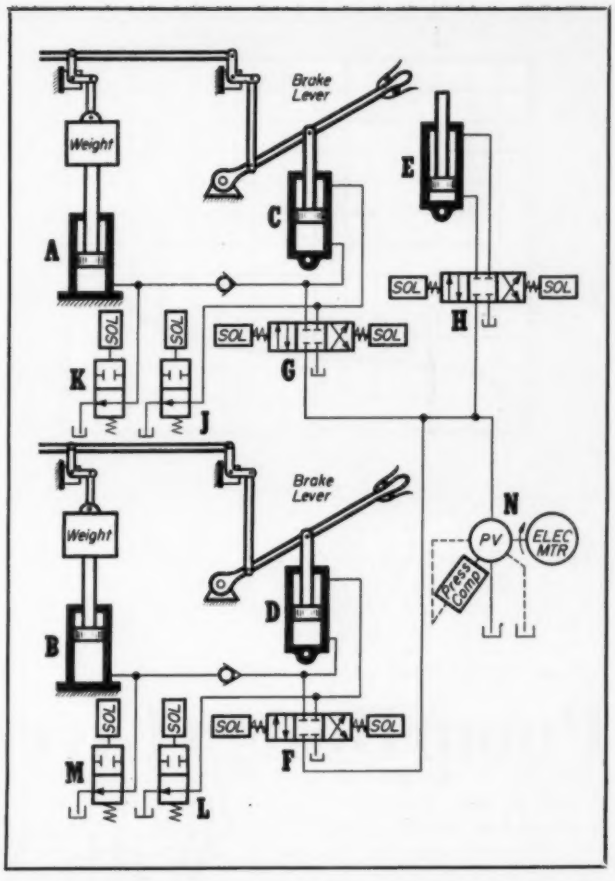
to overcome long steel rod links and bell cranks and apply the brakes was heavy and as the operator tired, work time increased and braking response became slow. When it was decided to install a hydraulic system, the first design was made to fully actuate the brake control lever by pressing an electric switch which would cause movement of the control valves directing oil pressure to the brake levers. After this installation was made, it was found that the operator lost "feel" when applying the brake. It was then decided to alter the system. Weights were installed to counterbalance the dead weight and resistance of the long rods and links, and to overcome friction. Through a system of lost motion linkage, the operator is able to obtain manually controlled cushioned slow down, of the moving load just prior to the application of the hydraulic force. The hydraulic power is used to apply the final heavy force to set and hold the brakes.

Power Failure Protection

The final hydraulic circuit is schematically shown here. When oil pressure is applied to the circuit, cylinders "A" and "B" move up releasing a weight from the rod which applies the brake. This weight acts as a safety device which prevents bucket travel in the event of power failure. Should there be an electric failure, valves "K", "J", "M" and "L" will open and the weight will drop to automatically apply the brake. It would be a very damaging accident if a bucket containing a large amount of coal was suddenly released and allowed to drop into the bottom of the boat.

Control levers have a double trigger, one on each side of the lever which alternately energizes the solenoids of "G" and "F". When the operator pushes down on the lever, he energizes a solenoid which applies pressure to the rod end of the cylinders. When the lever is lifted, a limit switch will automatically energize the solenoids of values "G" and "F" to apply pressure to the blank end of the cylinders.

Cylinder "E" operates a brake on the horizontal trolley which carries the bucket from the shoreline



OIL PRESSURE supplied by this system is at the operator's command. It can be applied full force at once; applied after cushioning or slow down, or omitted.

out to the boat and back. The operator does not require brake feel on this unit.

The installation is powered by a 12 GPM variable volume pressure compensated pump. During actual braking, oil pressure shifts the pump pressure ring, to reduce pump delivery. Required driving horsepower can adequately be supplied by a 7½ horsepower motor.

There has been a decided advantage in the application of hydraulics on this crane. The operator is well pleased and is able to function more efficiently when unloading a large coal boat.

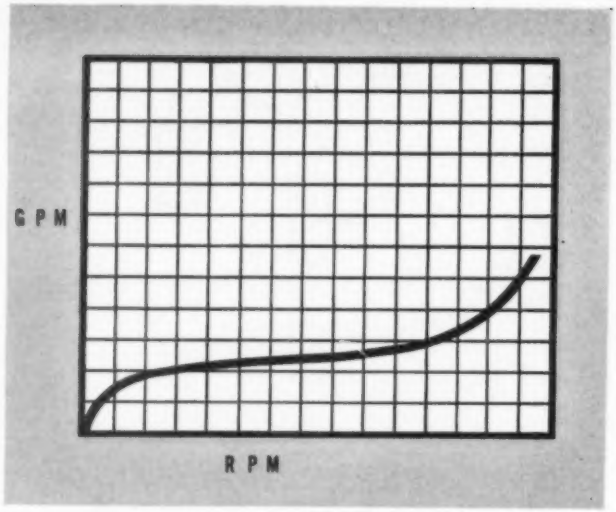
Prize Paper Contest Closes June 1st

IF YOU have planned or are considering entering the APPLIED HYDRAULICS Prize Paper Contest, *now is the time to do it.*

There is still time for you to enter. From titles of proposed papers on returned Entry Blanks, it is clear there will be some first rate design, application and maintenance entries to compete for the big prizes. Entries have come from as far as Finland.

A scoring chart has been prepared and points for judging have been weighed. Every entry will be carefully considered by the three judges, Walter Ernst, The Commonwealth Engineering Company of Ohio; Dean M. Cleaveland, Bendix Aviation Corporation; J. R. Hemeon, Ternstedt Div., General Motors Corp.

With every Entry Blank we will send the Rules of the Contest and Suggestions to Contestants, including 25 suggested, appropriate subjects. Ask for your Entry Blank NOW!



By controlling the piston stroke on a compact positive displacement pump, oil delivery can be held practically constant with changing shaft speed.

Pump Design Gives Controlled Delivery With Variable Input Speed

RECENT applications of hydraulic power on engine driven equipment have required the development of pump and control circuits which will give practically constant oil delivery over a wide range of engine speeds. One of the most compact pumps designed to meet this operating characteristic is a piston type unit having a pressure controlled stroke—as rpm increases, piston stroke decreases to keep oil delivery nearly constant.

Applied on vehicle steering gears and on refrigerated vans whose cooling units are driven by hydraulic motors, the pump presents advantages over conventional pumps which must be provided with bypassing arrangements for decreasing discharge at high speed. Pump wear is reduced and vehicle engine horsepower is saved.

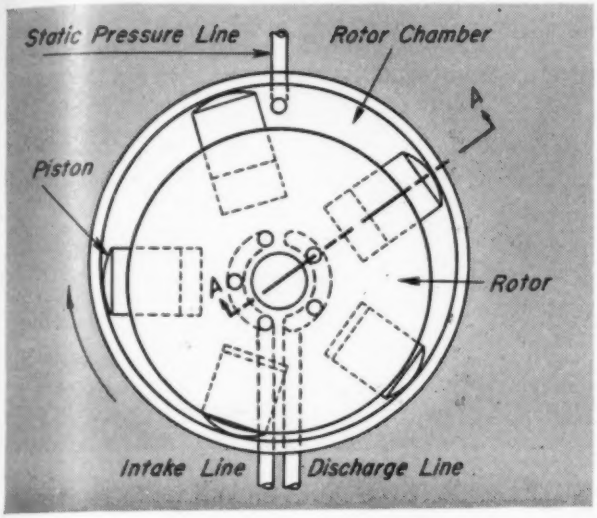
Each piston discharges and intakes through an axial drilled port in the pump rotor; each port communicating with the chamber below the piston skirt which remains after the piston has moved inwardly its extreme travel. These ports register with kidney-shaped pockets in the pump and cover, one pocket designated as the intake manifold, the other as the discharge. The intake stroke of a piston occurs during the part of the rotor rotation when the piston is moving outward and its communication hole is registering with the intake manifold.

When moving inward, each piston delivers oil to the system through the discharge manifold. The pistons are compelled to move outward by centrifugal force and suitable springs and inward by the rotor chamber bore.

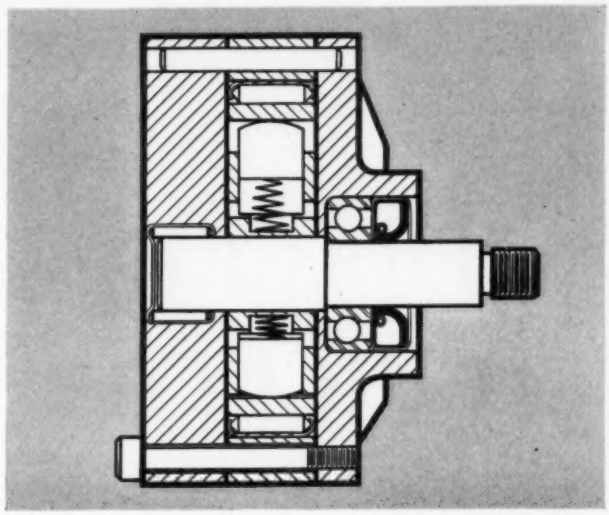
The crescent shaped volume surrounding the rotor and pistons formed by subtracting the rotor volume from the bore volume is maintained full of oil. This oil does not communicate with the discharge side of the pump; however, this chamber is vented, so that the oil pressure in it can be varied. Any piston progressing through its intake stroke is subject to the following radial forces:

1. Outward
   a. Centrifugal (varies with speed)
   b. Spring (varies with compression)
2. Inward
   a. Rotor chamber oil pressure (variable and controllable)

If, at a given speed resulting in a certain summation of outward forces, the rotor chamber pressure is increased to equal these forces, the pistons will not stroke; further, if the chamber pressure is carefully



PISTON STROKE can be controlled by opposing the centrifugal and spring forces, which tend to move the piston outward, with a static oil pressure in the rotor chamber.



COMPACT DESIGN uses needle bearings. This model has an outer housing diameter of 5 inches. At full stroke, oil delivery is less than one cubic inch per revolution.

Drawings and data courtesy Shallcross Controls, Inc.

adjusted then the pistons can be made to accomplish only part of their intake stroke—any fraction desired. Thus, modulating the rotor chamber pressure gives a variable volume pump which will deliver a constant volume regardless of discharge pressure.

It can be seen that if the rotor rpm is increased it will be necessary to increase the rotor chamber pressure to maintain a given volume. On the automotive type pump this is accomplished by the piping arrangement shown in the circuit drawing which requires the use of an open center valve on the vehicle steering column and a small orifice or restriction placed on the downstream side of the valve and expansion tank or chamber placed between this orifice and the pump inlet. An impulse line connects the inlet side of the orifice to the pump rotor chamber.

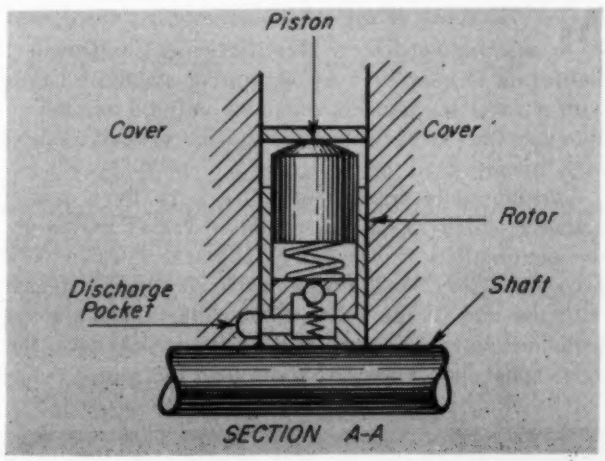
Orifice Creates Back Pressure

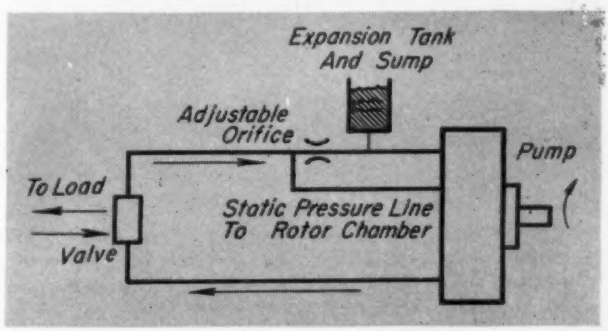
The orifice is chosen so that substantial back pressure will result after the required minimum gallonage is obtained. Any pressure existing between the valve and orifice will reflect in the rotor chamber and thereby act inwardly upon the pump pistons.

If the pump rotor speed were increased, a proportional increase in discharge would result except for the added back pressure at the orifice inlet and increased inward forces on the pistons opposing their outward stroke. In this way the discharge increases very little with increasing speed, since the orifice back pressure increases rapidly to result in a discharge curve similar to that shown in the drawing.

A piston just finishing an intake stroke almost never is tangent to the bore; however, as soon as it communicates with the discharge manifold it will move sharply outward and strike the bore. To prevent this, a check valve is placed between the piston chamber and the axial communication hole.

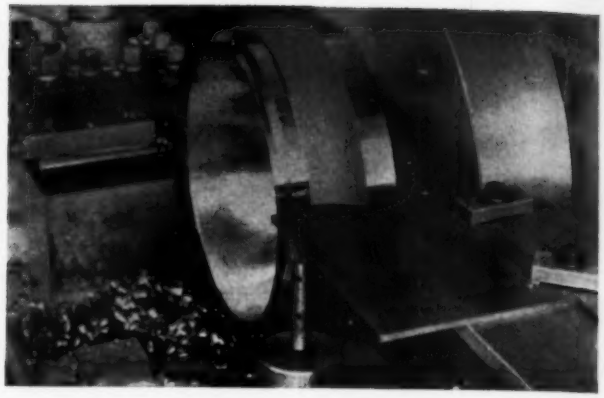
BECAUSE THE PISTONS seldom operate to the outer stroke limits against the bore, a check valve is put in each piston chamber to prevent outward piston movement which could be caused by pressure from the system when the piston chamber first communicates with the discharge manifold.





ORIFICE IN THE CIRCUIT may be adjusted to vary the static pressure in the pump rotor chamber. As drive rpm increases, the back pressure created by the orifice increases to exert a greater inward force on the pistons to oppose their outward stroke.

TRACER CIRCUIT



for machining guided missile parts

MACHINING of difficult contours for guided missile parts at Rheem Manufacturing Co., Downey, California is simplified by equipping standard lathes with a tracer mechanism, requiring only 68 minutes to complete the part, as compared to conventional method of 3 hours.

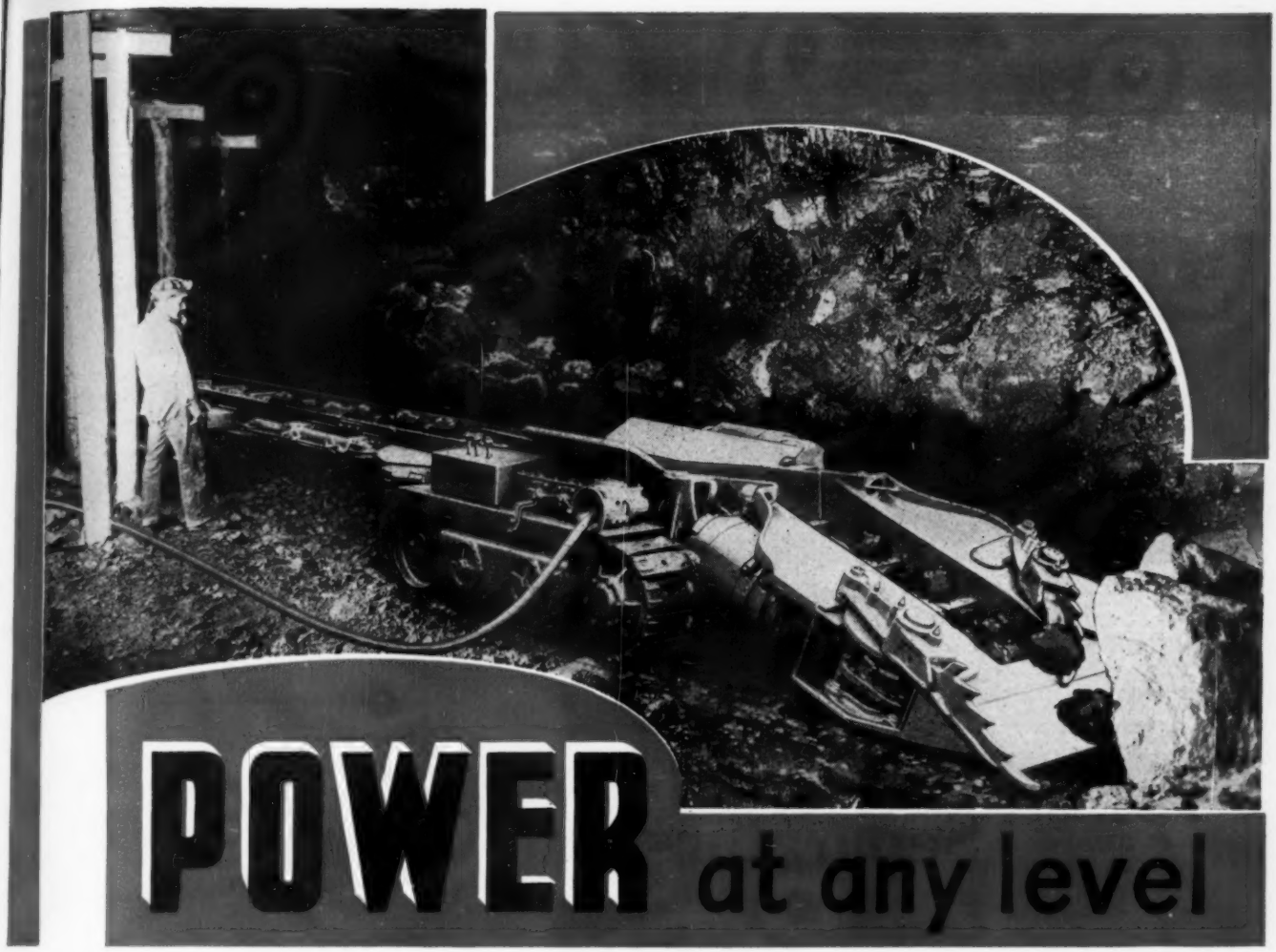
Turning tools are fed into the work by a power cylinder which has its direction of travel varied by the action of a tracer valve. The tracer valve is a precision 4-way, spring offset valve. A stylus, integral with the end of the valve spool, rides against a flat template. As the contour of the template changes, the valve spool moves and delivers oil to the power cylinder to move the cutting tools in the same pattern as the template. Using a power cylinder set at 45 degrees, longitudinal feed is continuous. Feed does not have to be stopped during a step cut.

In turning the inside and outside diameters of these air tank heads, 23 pounds of stock at 12 inch diameter must be removed from rough forgings of 4130 aircraft steel. This is accomplished with +.005/−.000 tolerances.

A full spherical radius had to be cut inside. The contour starts straight and blends into 2¾ inch radius and blends again into 8 inch spherical radius. By ordinary methods this seemed almost impossible, but the problem was easily solved with installation of a hydraulic duplicator.

The ease of set-up and simplicity of tooling with this attachment provides many advantages, including use of conventional tools which produce a better, smoother surface finish than can be obtained with costly form tools. The finish tool for making the final cut requires no adjustment for size from rough to finish as tools are set in proper relation. Facing to length, inside bore and radius to centerline are all controlled by the template and first size setting when set-up is made. Calipering is confined to first diameter only, with subsequent diameters obtained automatically.

FINISHING THE O. D. of a guided missile part. The stylus point follows the template to guide the tool by power feed, reproducing the exact contour on the part.



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MOTORS
VALVES
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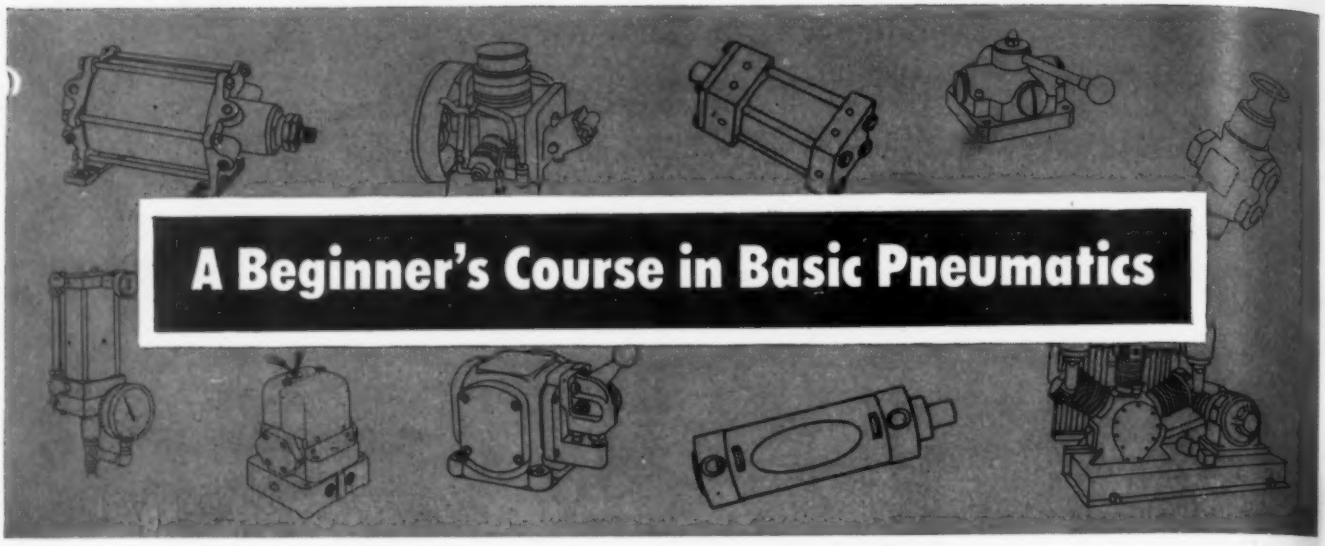


Section II The Distribution System

Separators and Traps

Part Six

SEPARATORS and traps in a compressed air system are used to remove moisture that has been condensed in the aftercooler, receiver or other parts of a distribution system. A well designed aftercooler, properly chosen, will condense a very considerable part of the moisture which enters it. For this reason the most common position for a separator is immediately after the aftercooler. However, moisture must be removed from other parts of the distribution system and separators and traps are also placed at strategic low points in the system or immediately ahead of outlets or points-of-use which must be supplied with moisture-free air.

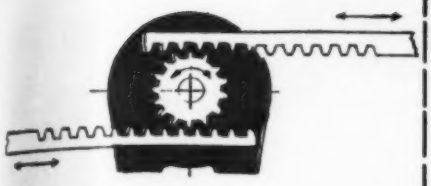
The distinction between separators and traps is not always a clear one. In general, the separator is a device with multiple or enlarged condensing surfaces with a chamber for storage of condensate; the trap, while it may act as a storage chamber, is primarily a dumping device for expelling water from the air system. Separators may be integral with aftercoolers or with traps or they may be separate units. In the same manner, traps may be a part of a combined unit designed to condense and remove water or they may be separate. Traps are commonly used as automatic dumps at low points in distribution lines.

The overall efficiency of the aftercooler is dependent on the ability of the separator to eliminate the condensed moisture and oil from the air flow. Standard separators for medium and large compressed air systems are normally installed at the discharge end of the aftercooler.

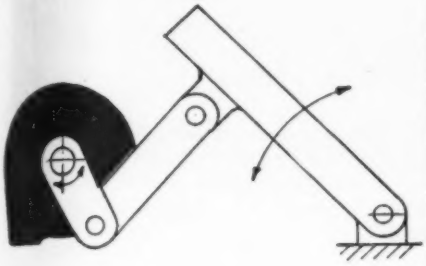
Separators

The cyclone design of the Worthington separator, shown in Figure 1, follows the principle of velocity separation in which particles heavier than air are removed by centrifugal force. The high velocity created by the converging walls of the cone forces the water and oil through the bottom opening into the storage chamber. The cleared air continues upward and passes out through the discharge pipe.

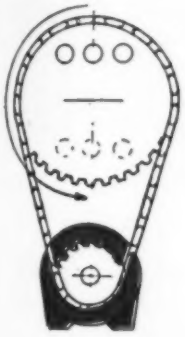
The storage chamber is provided with a drain connection and sight glass to indicate the level of the removed condensate. An automatic trap, definitely



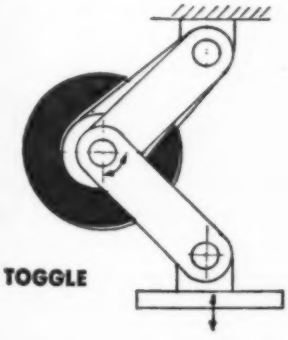
STRAIGHT LINE MOTION
DOUBLE TRAVEL



LIFTING



FIXTURE
POSITIONING
OR
INDEXING



TOGGLE

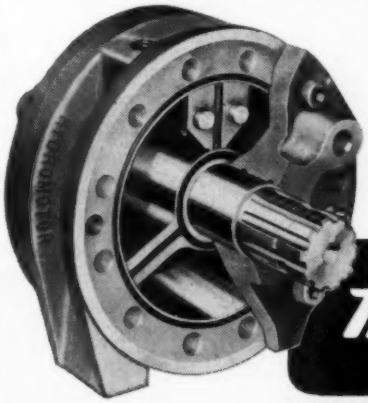
you can perform ALL these operations smoothly, positively, efficiently, with the space and weight saving

Hydromotor

Completely sealed and self-contained, the Hydromotor is a simple, dependable, maintenance-free source of *reciprocating rotary power*, installable anywhere . . . at any angle.

Using any hydraulic medium, the Hydromotor develops instant, full torque in either direction through any arc up to 280° . . . may be stopped at any point, reversed, speeded up or slowed down by simple controls.

Standard models develop 1,500 to 115,000 inch pounds torque at 1,000 p.s.i. input. Two vane models, same size, afford double torque values through arcs to 100° —all based on 1,000 p.s.i. oil supply.



For complete application and engineering data, write for Hydromotor Bulletin 21, *or outline your requirements.*

Hydromotor DIVISION

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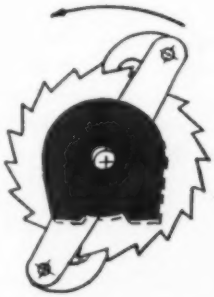
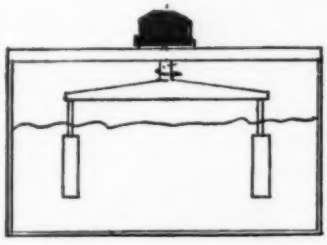
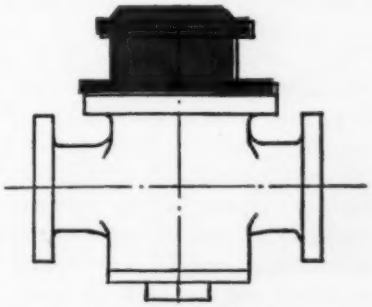


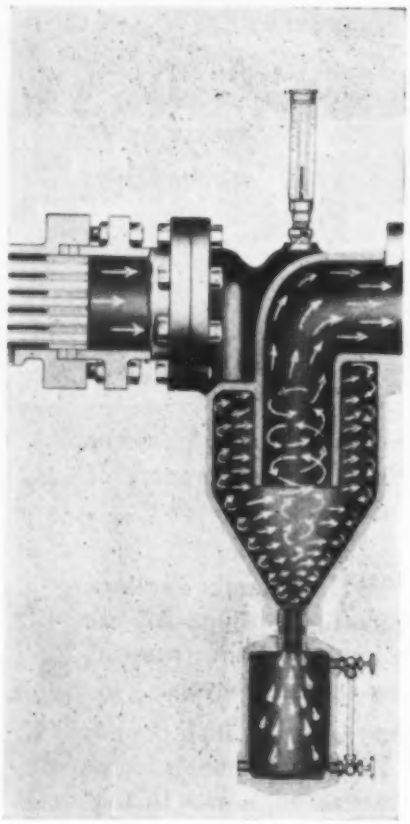
HIGH TORQUE RATCHET DRIVE



MIXING OR AGITATION
(OSCILLATING ACTION)



VALVE TURNING



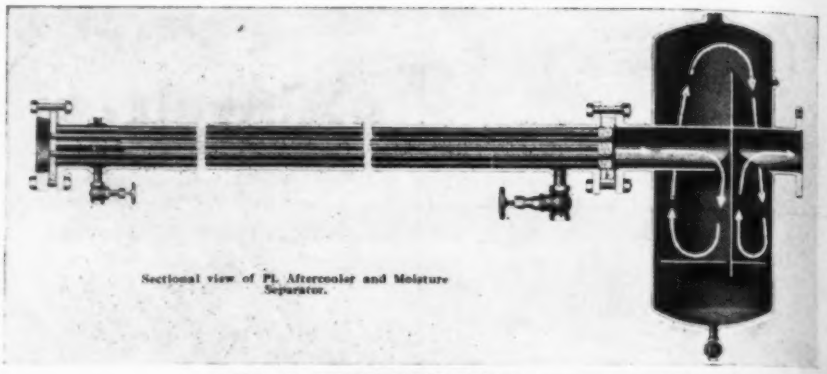


FIG. 2. INGERSOLL-RAND separator utilizes baffles to reverse air flow and trap out condensed moisture. Condensate accumulates in the bottom pocket away from the air stream. Automatic traps are recommended for this type of separator.

FIG. 1. CROSS SECTION view of the Worthington Corporation "cyclone" separator illustrates the principle of velocity separation. Particles heavier than air impinge on the converging walls of the cone; condensed water and oil drops into the base storage chamber.

recommended, is normally connected to the base of the storage chamber.

A somewhat similar separator is shown in Figure 2. This is the standard Ingersoll-Rand condensate separator. The separator is shown as normally installed at the air discharge end of an aftercooler. The separator is baffled to reverse the direction of air flow several times to reduce the velocity and to condense the maximum amount of moisture. The condensed moisture drops through the perforated bottom plate into an unusually large condensate pocket. Water thus removed from the air path cannot be again picked up by the air. An automatic trap is installed at the condensate drain.

Point-of-Use Separators

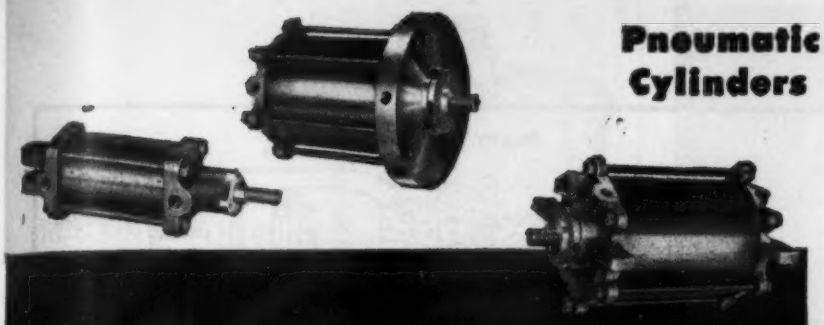
We have gone far enough in our discussion of distribution systems to understand that it is necessary to protect a compressed air system against vapor and entrained water and oil at several points. While the aftercooler and the aftercooler-separator removes a high percentage of such contaminants, additional protection is often necessary or desirable. The receiver and its drain or trap is an additional protection against moisture, oil and dirt. In long lines, traps are often added at low points. Finally, as insurance against moisture, especially for such operations as fine painting, mirror silvering, blowing dust from highly polished surfaces subject to corrosion, it is often good practice to add separators at the point-of-use.

Figure 3 shows a tpical point-of-use separator, the Triumph AA separator-filter, made by the Jas. A. Murphy Co., Inc., The unit is installed in the pipe line just ahead of the point of delivery. The illustration shows the separator unit (top) with a glass chamber and the hemispherical trap. A desiccant is placed in the chamber; when the desiccant turns to an amber color, it is replaced. The life of the desiccant depends on the amount of oil to be removed. The unit also eliminates vapors.

Another typical separator unit for low volume of compressed air and gas lines is the mechanically operated Goodyer A-1 Pur-O-Fier, shown in cross section in Figure 4. Designed to operate with from one to five cfm (1 to 75 psi), the unit operates by positive centrifugal action of the entering air. The scrubbing action impinges free moisture, oil and all foreign matter against the walls of the transparent plastic sump. The sump is drained periodically as required by opening the drain valve at the bottom of the sump.

Traps

The ball float trap, shown in Figure 3, automatically ejects fluids which condense in the separator unit and pass through a bottom port into the trap. The "Zip



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- Fewer Valves to Stock
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- No Springs in Main Valve

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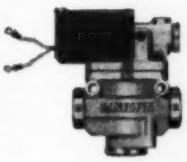
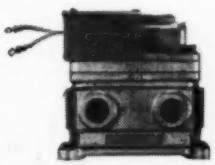
2 and 3-Way Valves.

Same valve operates 2-way or 3-way, normally open or normally closed. ⅜" to 1¼" I.P.S.





4-Way Valves.

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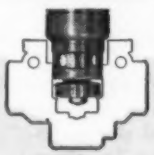
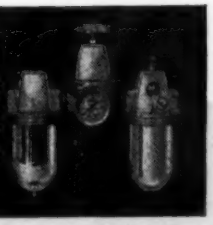


AIR WARDEN

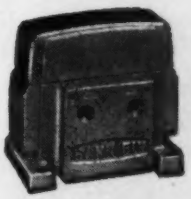
Air filters, pressure regulators and lubricators to protect air operated equipment. Bulletin 1010B.



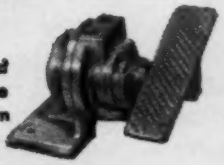
Disc Type Air Control Valves

Designed for smooth, positive and accurate control of air-operated equipment. Bronze discs lapped to perfect seal with seats. Packless design. For hand, foot or electrical operation. Sizes: ⅛" to 1¼" I.P.S.

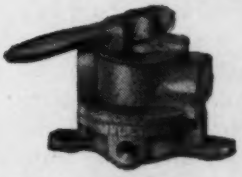
Write for Bulletin 57-W



Hannifin "Directair" electrically controlled air-operated disc valve



Foot-operated treadle valve (Also spring return and rotary types)



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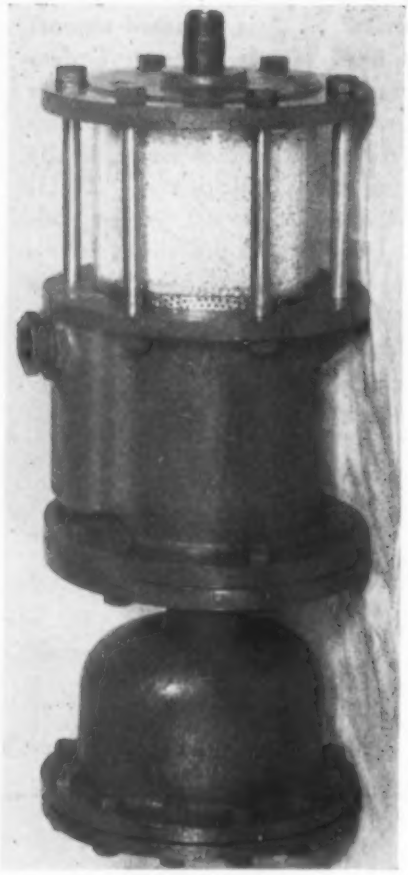


FIG. 3. TYPICAL point-of-use separator, the Murphy Triumph AA separator-filter unit, is shown. A replaceable dessicant is placed in the glass fitted upper chamber. The "Zip Action" automatic trap with snap action float (below) is shown in its normally installed position.

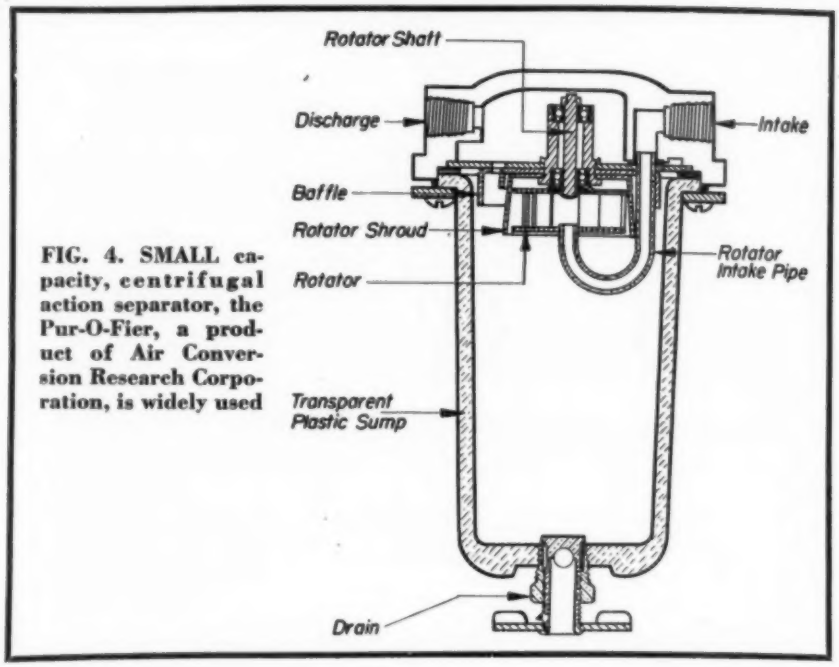


FIG. 4. SMALL capacity, centrifugal action separator, the Pur-O-Fier, a product of Air Conversion Research Corporation, is widely used

A combination dehydrating device, mechanical filter and self-purging trap, the Condensifilter, manufactured by Hankison Corporation, is shcwn in Figure 6. Compressed air enters through the center shaft at the bottom; it is dehydrated as it passes through the water-cooled spiral condensing section; dirt, oil and other contaminants are removed by the filter cartridge;

FIG. 5. CCA Products automatic unloading, float type trap, often used with a filter unit, unloads water through a side port to a bottom drain. The hemispherical design is compact for installations in close quarters.

Action" trap has a very short ball float lever attached to a strip of stainless spring steel. When the valve is closed the spring is bent outward. As condensate enters the trap, the ball rises and the spring is straightened, storing energy until it passes dead center, when the valve snaps open to permit the condensate to expel. Then, as the water level in the trap falls, the cycle is reversed and the valve snaps shut. The trap may be installed at any point in a system where moisture collects, including water legs and receiver tanks.

Another manufacturer, CCA Products, offers an automatic, ball float type, unloading trap, Figure 5, to drain water from compressed air lines, air line filters, receiver tanks and aftercoolers. When the large float ball is elevated by the rise in condensate, moisture is expelled through a side port to a bottom drain opening. Small amounts of liquid will unseat and seat the ball, permitting a compact, hemispherical body design, an advantage when the filter and trap units are combined for use in close quarters.

the clean, dry air re-enters the system through the center shaft; and contamination is discharged through the automatic trap. The low cost, disposable cartridge is quickly replaceable.

A float operated, snap action trip is integral with

FIG. 6. COMBINATION unit, the Condensifilter, incorporates a dehydrator, a mechanical filter and an automatic trap. The unit has a rated capacity of 30 cfm at 100 psi.

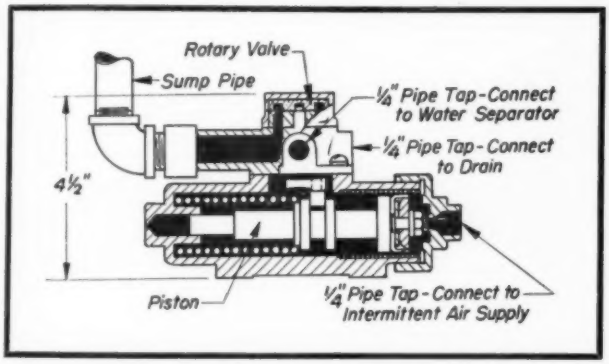

Rotary Valve
Sump Pipe
⅛" Pipe Tap - Connect to Water Separator
¼" Pipe Tap - Connect to Drain
4½"
Piston
¼" Pipe Tap - Connect to Intermittent Air Supply

FIG. 7. AUTOMATIC National Pneumatic water ejector valve is operated by an intermittent air supply to alternatively store water from the separator into a vertical sump and to discharge it to drain.

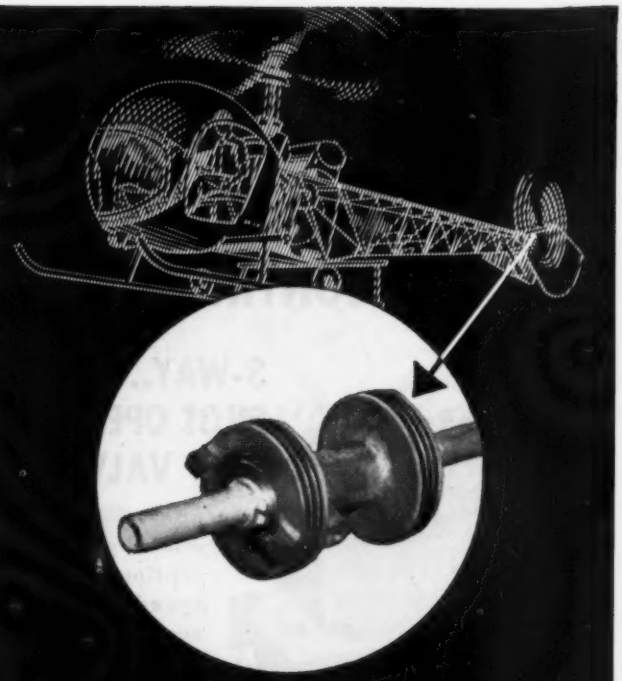
the Condensifilter base, not shown in Figure 6). Accumulated condensate is discharged through the trap valve which is designed to prevent leakage or pressure loss. The action of the trap is automatic.

Ejection Valve

A unique rotary valve, made by National Pneumatic Company, is designed for automatic water ejection in a compressed air system. The automatic water ejection valve, Figure 7, is operated by air pressure (50-125 psi) applied to the operating piston through the port which is connected to an intermittent air supply. Various arrangements to insure an intermittent air supply are available for both continuously operating and start-stop compressor operation.

With no pressure on the piston, water is forced out of the separator or other unit to which the valve is connected, through the rotary valve into a vertical

Continued on next page



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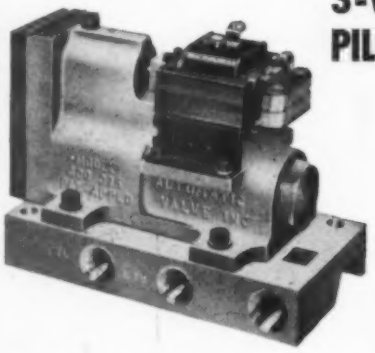
AV AIR CONTROL VALVES



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sump. When pressure is applied to the piston, the rotary valve is turned, first disconnecting the sump from the air system and then connecting it to the drain. The water deposited in the sump is then forced out of the sump into the drain pipe.

As air pressure is removed from the operating piston, the valve returns to its original position, first closing the connection between the sump and drain, then connecting the water collecting point of the air system with the sump for the next charge.

The water ejector valve may be installed in a compressed air system with either a continuously running or a start-stop compressor. In a continuously running installation an unloading valve and unloading pressure regulator are used to furnish intermittent air supply to the piston port of the ejector valve so that water may be alternately stored in the vertical sump and discharged to drain. Several different arrangements are used to operate the valve when installed in a system with a start-stop compressor.

The next installment will describe the selection and care of air hose.

Rope Testing Machine

Concluded from page 62

existence capable of testing rope, but it is believed to be the largest capacity hydraulic machine specifically designed for that purpose. The bed or frame of the machine, on which two capstans are mounted, has an overall length of 37 feet 6 inches. One of the capstans can be adjusted to a number of positions before testing starts. The other moves during the test to load the rope sample. The sample length of rope is eye spliced at both ends and placed over these capstans. Load is applied to the sensitive pulling head by a hydraulic cylinder used in conjunction with a constant delivery pump and an orifice type volume control.

The direction of movement of the pulling head is controlled by means of a four-way valve and its rate of movement is controlled from a handwheel, both of which are conveniently located on the writing table of the machine. The load weighing mechanism consists of a lever system and pendulum indicator which automatically balances the load on the specimen. Load is transmitted from the sensitive pulling head through the cylinder to the main lever. The cylinder itself is suspended by flexible linkages to allow accurate transmission of the load to the main lever.

The pendulum load indicator gives readings in four scale ranges, any one of which can be obtained merely by changing the weights on the pendulum. The four scales are: 0 to 12,000 lbs., 0 to 30,000 lbs., 0 to 60,000 lbs., and 0 to 120,000 lbs. All results are accurate to within ½ of 1% of recorded load.

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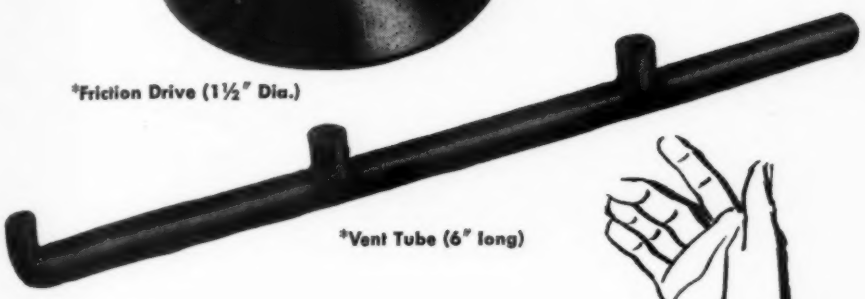

*Vent Tube (6" long)

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Part 9 of a Series on Fluid Lines

FLARELESS FITTINGS

By R. W. Phillips

Ermeto Flareless Fittings

The Weatherhead Company has developed a fitting which does not require any flaring. It differs primarily from the flareless fittings used up to 1936 in that it cuts the tube and is designed primarily for high pressure service or service in which extreme conditions of vibration as well as pressure may be encountered.

There are two versions of the fitting in general use at present: one, the industrial fitting; the other, an aircraft fitting. The principle of operation is identical in both. The differences involve threads, seat sizes, ring sizes and materials. Figures 1 and 2 illustrate a typical Ermeto aircraft fitting (MS 21900) ready for assembly and assembled. Figure 3 illustrates a comparable industrial fitting.

The fitting consists of three parts in each version —a connector, externally threaded with an external seat, a nut, internally threaded and a sleeve, sometimes called a ring or ferrule.

In the aircraft version the nut and connector has the same threads as the AN flared fitting and can be used with stationary "O" ring seals and AN threaded parts. The commercial version would require a special adapter for such adaptation. Such adapters are available.

At the base of the internal thread in the nut there is an angle of 45 degrees which forces the sleeve forward during assembly. This forward motion produces two effects: (1) it causes a cut to be made in the tube, and; (2) it causes the ring to grip the tubing at the 45 degree flare. This second action tends to keep vibration of all stresses from reaching the ring cut

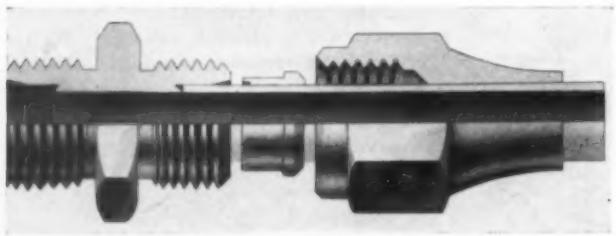


FIG. 1. CONNECTOR, nut and sleeve of an aircraft Ermeto fitting (MS21900) ready for assembly. Note position of sleeve and that tube is bottomed in the connector.

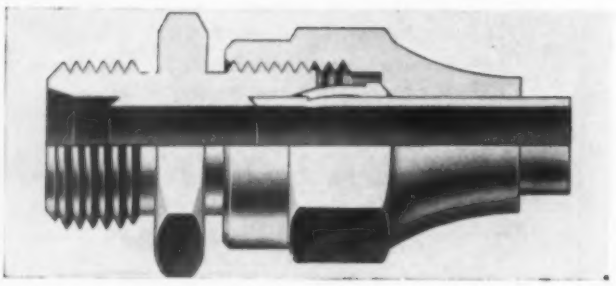
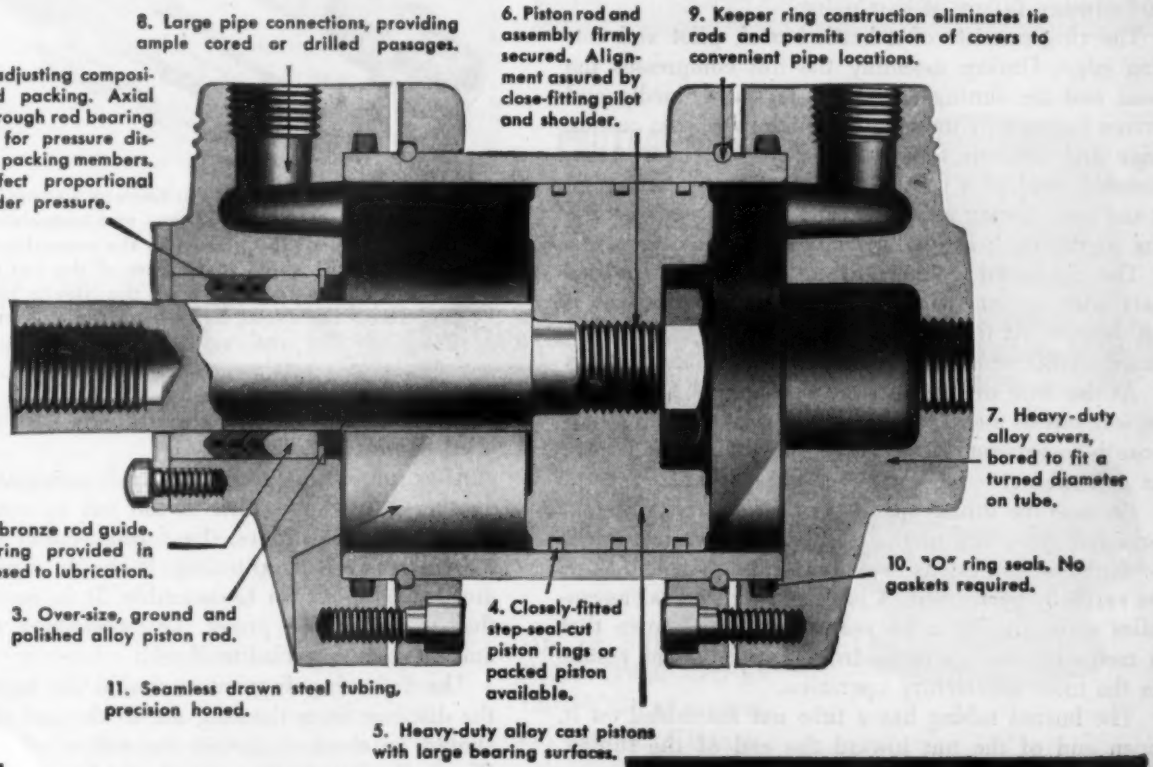


FIG. 2. THE SAME fitting shown in Fig. 1, assembled. Note that the forward cutting edge of the sleeve has been driven inward, imparting a spring washer effect on the tube.

More Power to You


8. Large pipe connections, providing ample cored or drilled passages.
6. Piston rod and assembly firmly secured. Alignment assured by close-fitting pilot and shoulder.
9. Keeper ring construction eliminates tie rods and permits rotation of covers to convenient pipe locations.
1. Self-adjusting composition rod packing. Axial holes through rod bearing provide for pressure disposal on packing members. Seal effect proportional to cylinder pressure.
7. Heavy-duty alloy covers, bored to fit a turned diameter on tube.
2. Ample bronze rod guide. Rod bearing provided in area exposed to lubrication.
10. "O" ring seals. No gaskets required.
3. Over-size, ground and polished alloy piston rod.
4. Closely-fitted step-seal-cut piston rings or packed piston available.
11. Seamless drawn steel tubing, precision honed.
5. Heavy-duty alloy cast pistons with large bearing surfaces.

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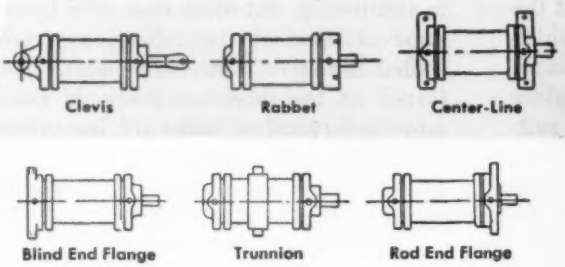

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All sizes and types

. . . flareless "bite" type tube fittings are designed for high pressures and extreme vibration conditions

and causing failure at that point.

The ring consists of a head, barrel, pilot and cutting edge. During assembly the nut compresses the head and the cutting edge is collapsed inwardly and driven forward by the nut. The pilot guides the cutting edge and controls the depth of cut. The barrel becomes bowed as a result of the two forces acting on it and has a spring washer effect which prevents loosening of the nut when severe vibration is encountered.

The connector consists of an externally threaded part with an internal seat. The angle of the seat is 12 degrees. At the base of the 12 degree angle, there is a straight counterbored section which holds the tube.

At the base of the seat, the shoulder is 45 degrees in soft metals and 15 degrees in hard metals. Its purpose is to prevent the collapse inwardly of thin walled or soft tubing.

Because the fitting operates on an entirely different principle than any of the previously discussed flared or flareless fittings, its assembly is different and must be carefully performed. A long series of actual assemblies made during a 15 year period has shown that a method based on turns from a given point results in the most satisfactory operation.

The burred tubing has a tube nut assembled on it, open end of the nut toward the end of the tubing. When the sleeve is placed on the tube, the cutting edge must face the end of the tubing. The head of the sleeve must enter the nut first. The tubing, on which has been assembled loosely a nut and sleeve, is placed in a connector. Tubing must bottom on the shoulder of the connector. Now the nut is run down with a suitable wrench until the sleeve *just* contacts the tubing; from this point 1-1/4 to 1-1/2 turns are applied. With industrial fittings, tubing material does not effect the

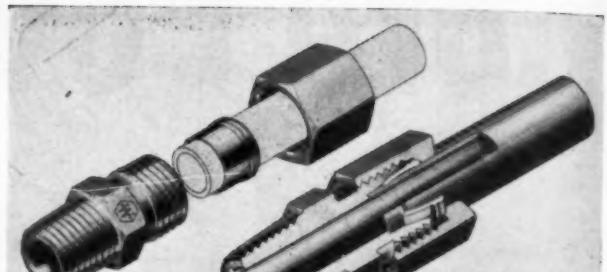

FIG. 3. AN INDUSTRIAL Ermeto fitting, shown lined up for assembly (above) and assembled. The ring cut in the tube, shown in the assembled view, is made by the angle at the base of the nut thread. The spring washer effect of the sleeve tends to keep stress vibrations away from the ring cut.

turns. With aircraft fittings, 1 to 1-1/3 turns are applied to preset the sleeves.

After presetting all fittings, all materials require another 1/6 to 1/3 turn of the nut to complete the seal. If leakage occurs, the fitting should always be loosened before retightening. It should never require more than 1/3 turn to assemble. It is recommended that the sleeve be preset, i.e., assembled on tubing and then disassembled to check.

The following inspection should be applied: (1) the distance from the ring out to the end of the tube should be checked against the values established by Weatherhead; (2) the pilot should be against the tube in soft tubing, not more than .005 from the tube; (3) some collapse of the tubing, especially where thin walled tubing is used, will result. The ring may be turned on the tube, but it should not be possible to move it forward or backward for any appreciable distance.

The Weatherhead Ermeto flareless fitting has been tested to 60,000 psi in a number of sizes before fail-

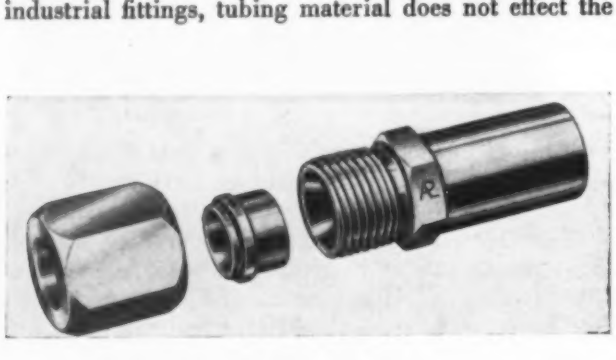

FIG. 4. THE THREE parts of the Ferulok fitting—nut, ferrule or sleeve and body or connector, in position for assembly. In assembly, the tube is inserted through nut, ferrule, into straight threaded end of body, to bottom on the internal seat in body.

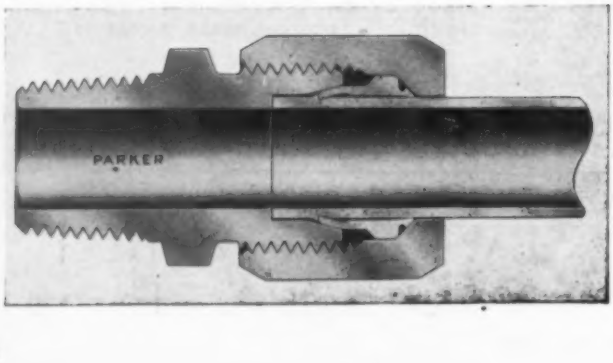

FIG. 5. A CUT-AWAY view of a Ferulok fitting showing how the ferrule "bites" into outer surface of the tube, providing a "shoulder" which is readily visible when fitting is disassembled for inspection.

ures have occured. It is recommended for all systems using high pressures. It can be safely used to at least 500 F. Principle troubles encountered in service have been with assembly. The ring can be assembled in the reverse position and the small size fittings can be over torqued. Larger size fittings may be under torqued. The fitting should be used with tubing heavy enough to support the ring cut or a mandrel may be used.

Equipment is now available for machine presetting sleeves, which eliminates much of the time required to hand preset sleeves. This equipment is air-hydraulically operated. It eliminates some of the problems of assembly which depend on the operator's alertness. For this reason, machine presetting is recommended where sufficient quantities of assemblies are made.

The aircraft fitting has been standardized under numbers 21900 to 21918. An SAE standard, using the same design, is now in process and will be issued by June, 1953. Eventually, the present industrial Ermeto will be replaced by the SAE standard fitting.

Ferulok Flareless Fitting

Ferulok flareless fitting, made by The Parker Appliance Company, is quite similar to the Ermeto fitting just described. The principal difference is in the ferrule or sleeve design.

Parker recommends the Ferulok especially for heavy wall tubing. Under extensive laboratory testing, as well as years of actual usage, the Ferulok has been found fully satisfactory for high pressure and extreme vibration conditions. The fitting holds leakproof at pressures high enough to burst the tubing. However, in conformance with the A.S.M.E. Code for Pressure Piping, the fitting is not recommended for temperatures very much in excess of 100 F.

As an aircraft adaptation of the Ferulok, the fitting is also made to MS specifications. The MS fittings differ from the industrial type only in: (1) materials, and (2) class of threads. The Ferulok is made in steel and is available in other materials. Aircraft MS fittings are made in aircraft grades of steel, aluminum alloy and stainless steel and with the more exacting aircraft class of threads. The MS line does not include pipe thread connectors as does the industrial line. Pipe threads are Dryseal.

The Ferulok is of three part construction, including a connector or body, nut and ferrule or sleeve. The fitting is assembled as follows: (1) the tubing is cut squarely, burred internally and externally to remove the burr (the ends should not be chamfered); (2) the nut is slipped onto the tube with the larger threaded opening of the nut toward the end of the tube; (3) the ferrule is slipped onto the tube with the cutting edge of the ferrule toward the end of the tube; (4) the nut is run down until the tube is bottomed on the internal seat of the fitting body; (5) the nut is tightened one full turn.

When the nut is drawn up, the internal surfaces of the nut and body act on the ferrule, causing the ferrule's cutting edge to "bite" into the outer surface of the tube. At the same time, the opposite end of

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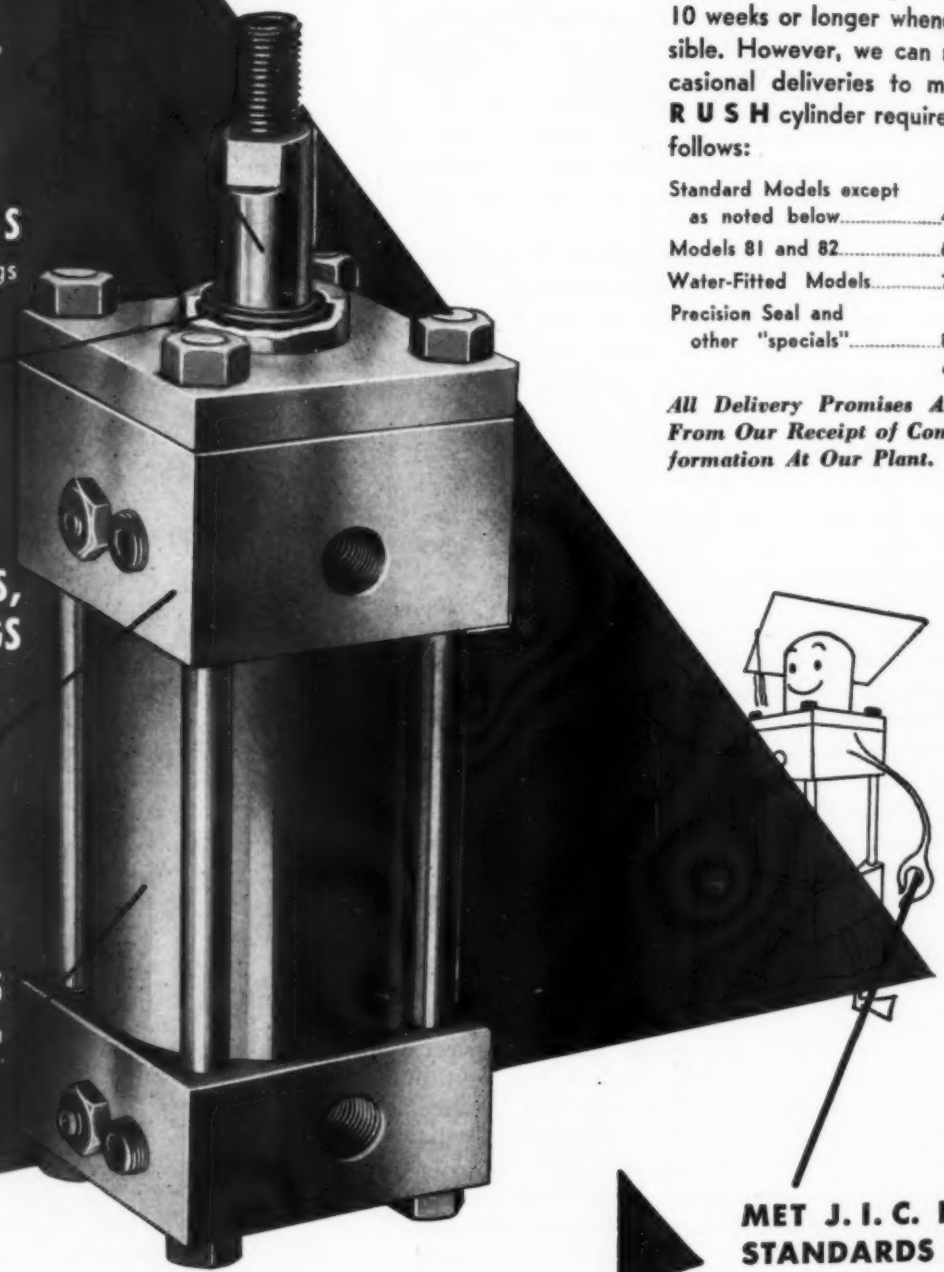

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the ferrule clamps the tube for the important vibration damping effect. The amount of tightening may vary slightly with different tubing. From experience, the mechanic will be able to determine what degree of variation will produce the optimum result.

The fitting is then disassembled for inspection. Since the cutting edge of the ferrule is exposed, the extent of "bite" into the tube is readily visible. If a definite "shoulder" of metal has not been turned up over the cutting edge of the ferrule, the fitting should be reassembled and the nut tightened further to insure an adequate "bite".

After inspection proves the "bite" to be satisfactory, the fitting can be reassembled by hand until the ferrule is seated. The joint then is completed by tightening the nut 1/6 to 1/3 turn further with a wrench.

Ferrulok straight threads are identical for aircraft MS standard, industrial and proposed SAE standards.

Fluid Fortress Flareless Fittings

A third type of high pressure flareless fittings is the Fluid Fortress fitting, made by Flodar Corporation. This hydraulic tube fitting has been designed to

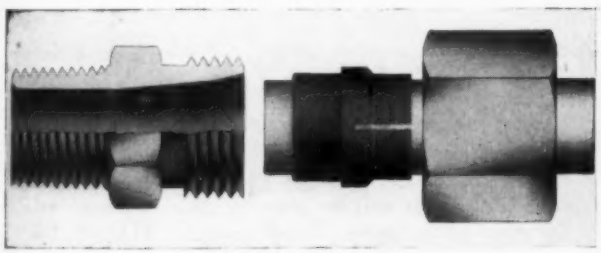

FIG. 6. PARTS OF the Fluid Fortress fitting lined up for assembly. Sleeve and nut are placed on the tube end, after which the tube is pressed against the slow taper in the connector by finger tightening the nut.

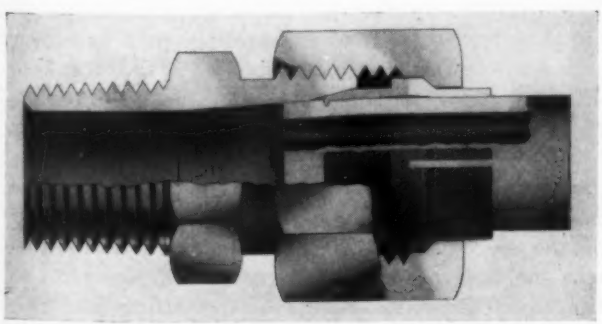

FIG. 7. WHEN THE assembled Fluid Fortress fitting is turned wrench tight, the sharp V-shaped rib on the forward end of the sleeve is forced into the tube and the slotted fingers on the rearward end of the sleeve grip the barrel of the tube like a spring collet, preventing excessive tube vibration and fatigue.

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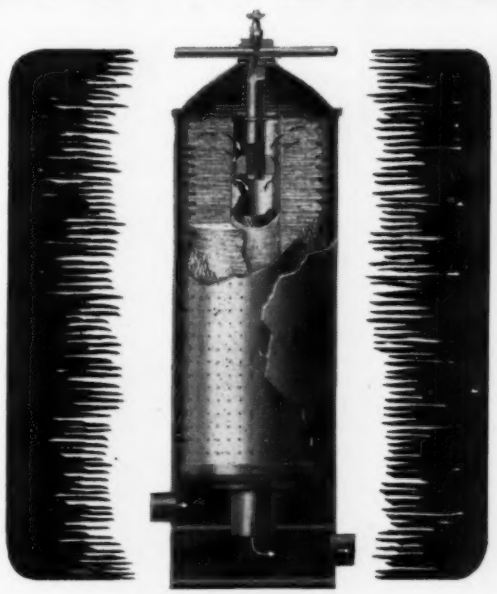

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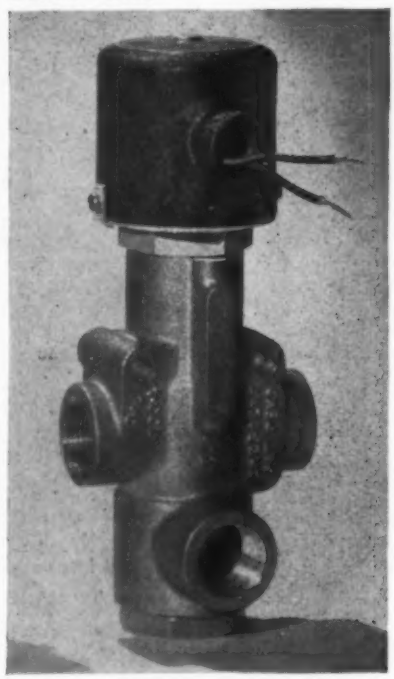

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overcome excessive vibrations, the most distinctive feature of this fitting is a contractible alloy sleeve made of chrome molybdenum steel, heat treated for hardness and durability and tempered for toughness and resiliency.

The Fluid Fortress fitting consists of three parts: (1) a connector body; (2) a tightening nut, and (3) a contractible sleeve. The sleeve is made in one piece, the forward end is solid, the rearward end is slotted, forming spring cantilever fingers. The fingers contract inwardly and frictionally grip the tube as the nut is turned tight, supporting the barrel of the tube against vibration.

The solid forward end of the sleeve is pressed into a flared mouth of a connector body when the nut is tightened. This pressing action cams or shrinks the forward end of the sleeve inwardly about the tube and radially forces the sharp internal V-shaped rib into the tube where it forms its own groove. This groove, burnished by the radial action, provides a good fluid seal between the sleeve and the tube. The engagement between the outside of the alloy sleeve and the inside of the flared mouth of the connector body creates a burnished surface for making a perfect seal each time the fitting is assembled.

To assemble the Fluid Fortress fitting, the operator: (1) removes burrs from the cut end of the tube; (2) passes the nut, then the sleeve over the end of the tube; (3) slips on the connector body and finger tightens the nut until the tube is pressed against the slow taper; (4) applies approximately two turns with a wrench. Approximately two turns of the wrench on the nut will either "hit home" or develop high torque. The fitting may be repeatedly reassembled as often as desired.

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A primary advantage of this type of fitting is the ease of assembly. In the smaller sizes, the dimensions of the sleeve prevent incorrect end-to-end insertion into the nut. Should the operator fail to count his tightening turns, the design of the fitting acts as a check. The space between the forward end of the nut and the wrench pad of the connector body, when the nut is turned two turns during assembly is approximately one-eighth of an inch. This acts as a convenient visual check for all fittings, including tee and elbow fittings.

The connector bodies and nuts are made of steel. The fittings may be applied to all commercial tubing. With adequate strength in tubing, the Fluid Fortress fittings will operate at pressures to 20,000 psi.

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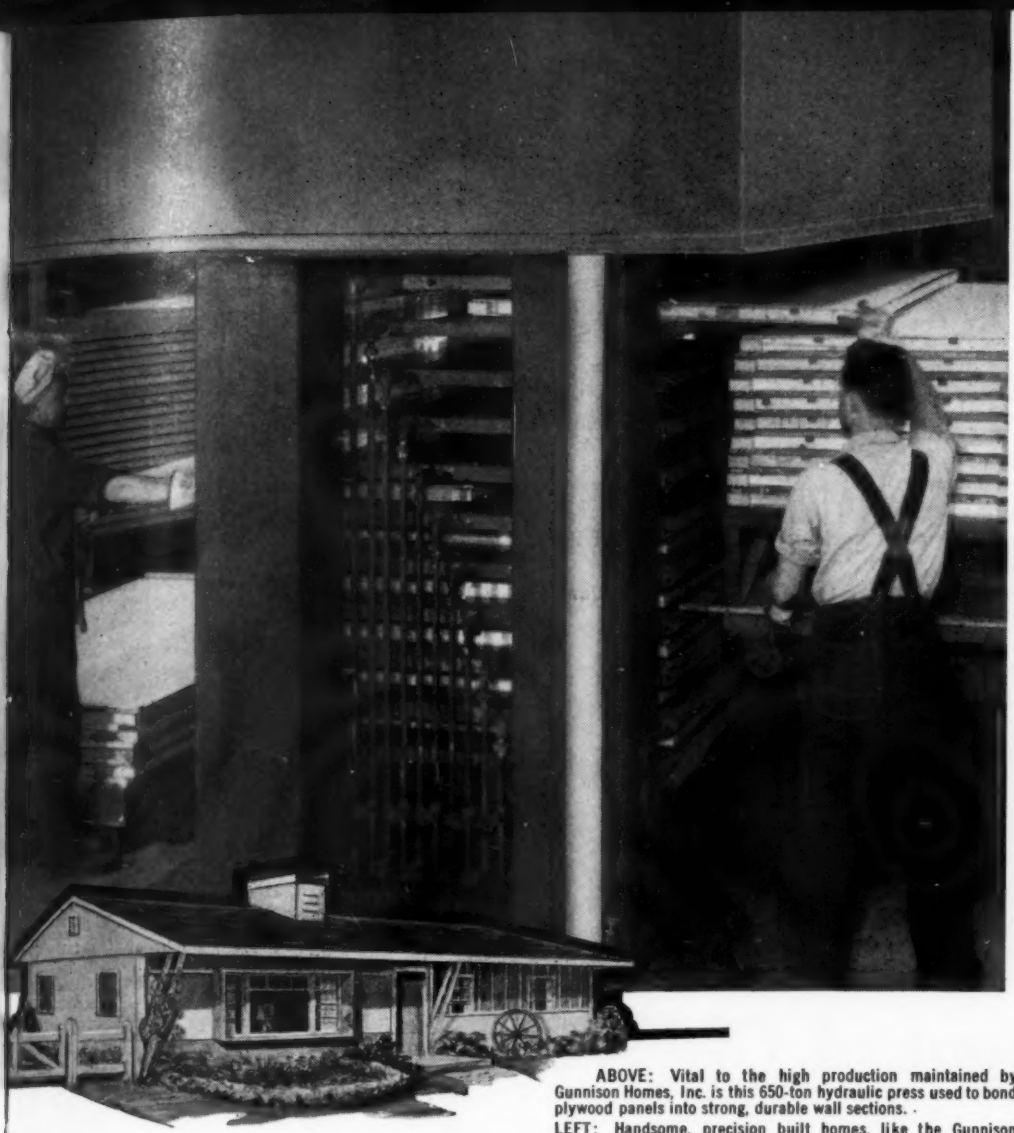

ABOVE: Vital to the high production maintained by Gunnison Homes, Inc. is this 650-ton hydraulic press used to bond plywood panels into strong, durable wall sections.

LEFT: Handsome, precision built homes, like the Gunnison Coronado pictured here, are built in a matter of hours.

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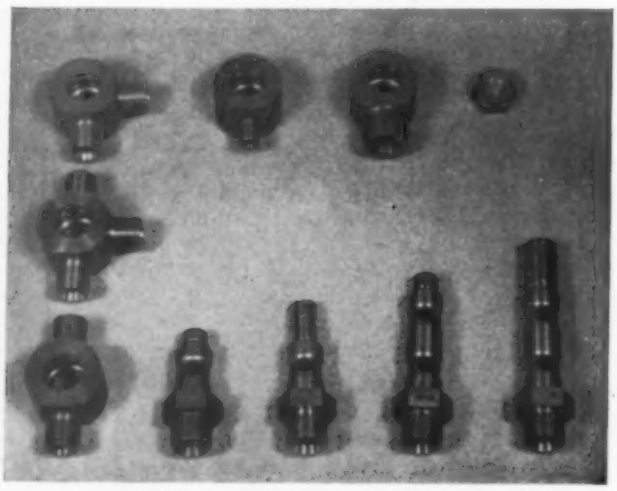
Development of CLUSTER FITTINGS simplifies aircraft circuits

FIG. 1. BASIC STYLES of stems and manifolds of the "low flow" cluster fitting series. Tubing connection outlets of each stem and manifold are variable to serve popular tube and port sizes.

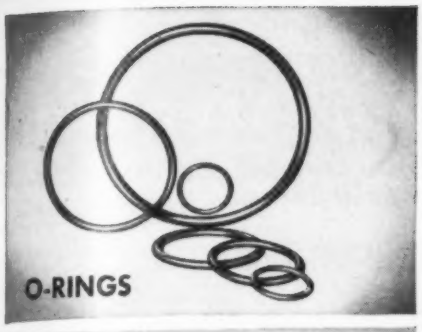


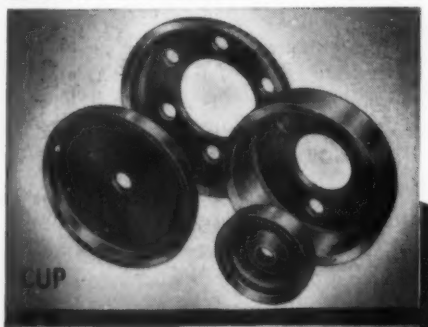
By Frank J. Hanback

THE cluster fitting, developed by the El Segundo Division of the Douglas Aircraft Company to meet the exacting requirements of high pressure hydraulic and pneumatic operations, have numerous advantages over standard fittings for applications in congested compartments where space as well as weight is at a premium. They replace manifold blocks and are useful in other special applications requiring maximum reliability under severe service conditions of pressure impulse and vibration.

High pressure hydraulic systems have become increasingly popular in nearly every field of design endeavor. Piping complexity has accompanied this trend to such a degree that most of the fittings and

FRANK J. HANBACK, Piping Development Engineer, El Segundo Division, Douglas Aircraft Co.





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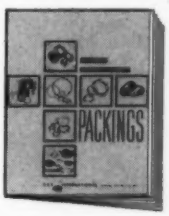

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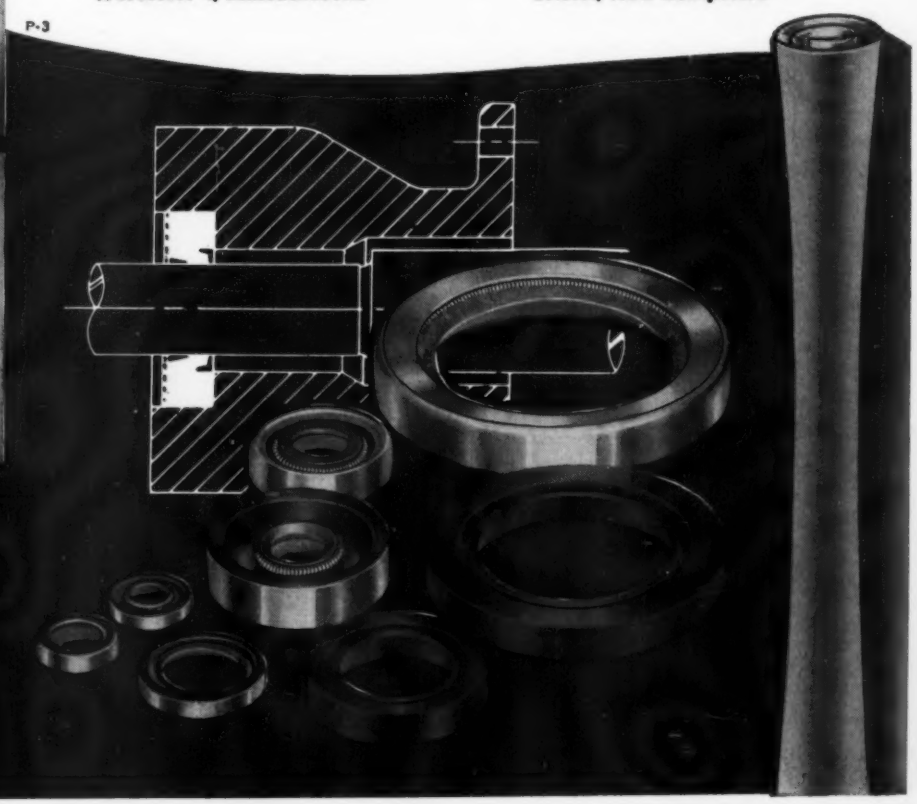

Designed for high pressure hydraulic and pneumatic applications in congested compartments, the new series of aircraft fittings, is easy to assemble. Simple arrangement eliminates hidden assembly errors and offers maximum reliability under severe service conditions of pressure impulse and vibration.

tubing material used a decade ago are marginal for the higher pressures used today.

Service reliability is of utmost importance. This fact can be better appreciated when the consequences of a rapid high pressure leak are considered. This type of leak can result in not only the failure of a specified aircraft mission, but the total loss of the airplane and its personnel. The importance of reliable sealing, simplified arrangement, ease of assembly and the elimination of hidden assembly errors cannot be over emphasized on high pressure piping and fitting applications.

To properly appraise the merits of these new cluster fittings it is necessary to review the conditions confronting high pressure piping application and the efforts expended to improve high pressure sealing characteristics of existing fittings. The major accomplishments have resulted in more positive sealing of straight unions in female boss connections and a new flareless type tubing end connection proved by laboratory tests to be approximately 20 times more resistant to impulse and vibration fatigue than flared tube connections. An improved leather backup packing nut arrangement for sealing the "O" ring on elbow and tee applications at equipment porting is available and performs satisfactorily when properly assembled. However, this application is generally avoided or prohibited on high pressure application due to the possibility of faulty positioning of the "O" ring groove in the boss. This possible hidden assembly error may cause the threads to cut the "O" ring when tightened and eventually leak in service. This condition is accentuated when several are used as a cluster.

Unfortunately, the accomplished or anticipated rework to existing fitting styles will not reduce piping

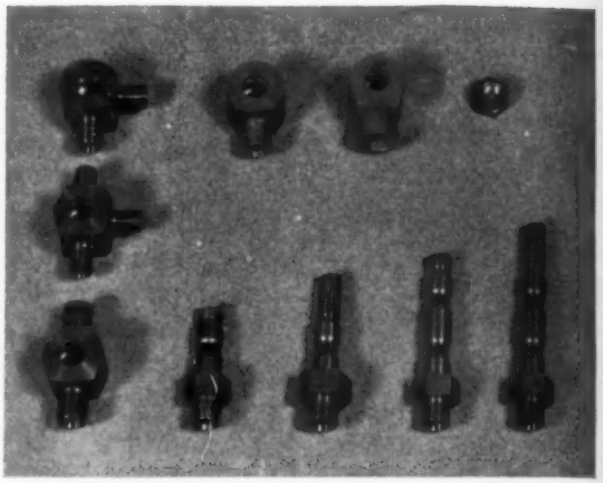

FIG. 2. "HIGH FLOW" cluster fitting basic styles of stems and manifolds. Variable size outlets provide virtually unlimited arrangements as manifolds are stacked on the constant diameter stems.

congestion and potential leakage points on complicated hydraulic installations. This requires a new style of fitting with more versatility than conventional fittings provide.

When piping is developed, it should be arranged with a minimum number of tube and "O" ring connections. This is the surest way of reducing service leakage and weight. The piping and fittings should be as direct and compact as possible and properly supported to take wrenching and vibration loads. Access for servicing lines and equipment must also be provided.

In congested compartments it is usually impossible

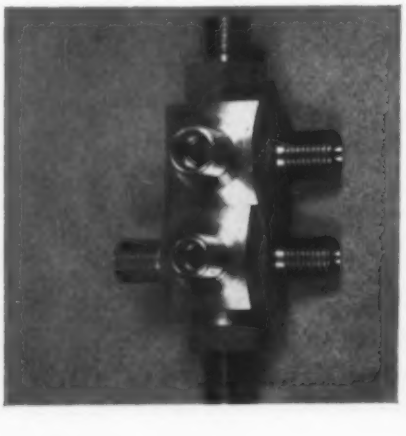

FIG. 3. TYPICAL "low flow" cluster fitting assembly.

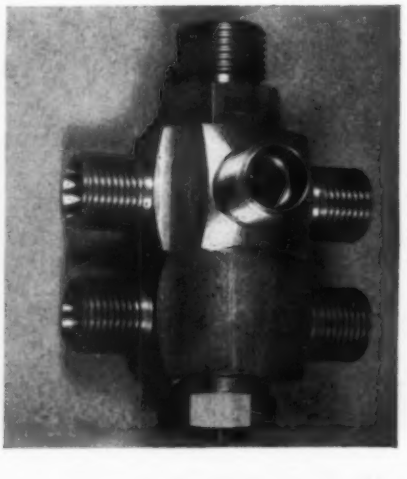

FIG. 4. TYPICAL "high flow" cluster fitting assembly.

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Sealing News & Tips

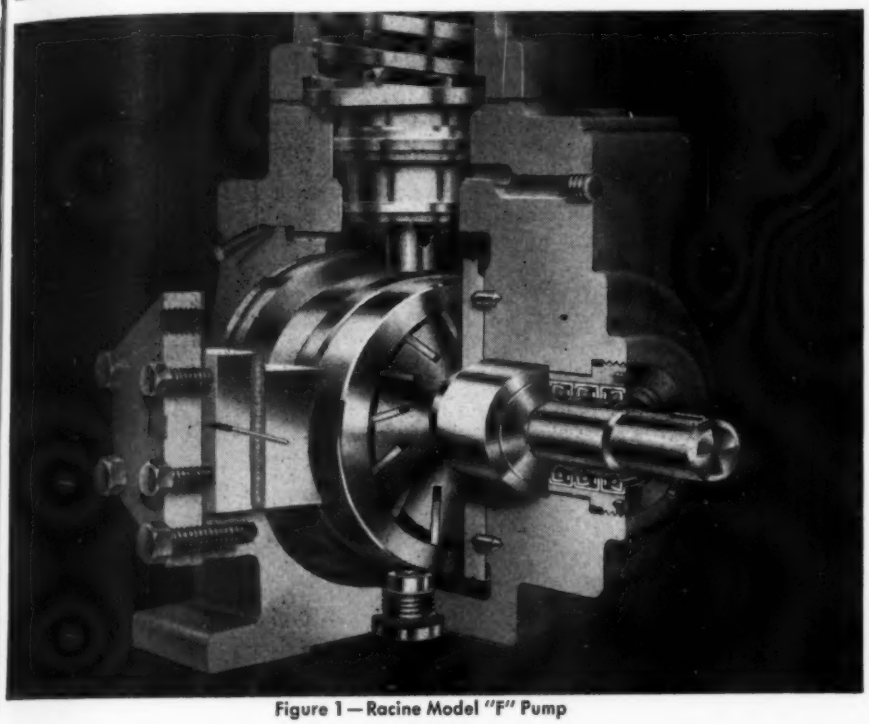

Figure 1 — Racine Model "F" Pump

Standard-design National Oil Seals, O-Rings give effective, low-cost sealing in Racine Pump

An unusual and highly economical solution to a two-way sealing problem is found in the shaft bearing assembly of Racine Hydraulic's Model "F" Pump.

Where the shaft enters the pump (Figure 1) it is necessary to prevent leakage of hydraulic oil (200 S.S.U. at 100°F) as well as intake of air, dust, and dirt. Pressure varies from slight suction to 25 p.s.i. Shaft speed averages 1,200 r.p.m. and the pump may be in continuous operation over long periods of time. External abrasive conditions are often very severe.

The unusual approach of Racine's engineers is to employ three single-lip National seals. All are modified National 50,000-S Syntech* seals—spring-tensioned units with precision-trimmed synthetic rubber sealing members inside a steel outer case. Two such seals are mounted with sealing lips inward to retain pressure and oil. The third seal is mounted outward and operates virtually "dry" as a dust excluder.*

On the faceplate assembly opposite the sealing point, Racine solves a static sealing problem economically with a commercial-grade O-Ring also supplied by National.

Racine's use of standard-design National seals not only expedites seal deliveries but saves tooling costs. Whether your application utilizes standard-design seals or requires special seal design, National Applications Engineers are at your service.

Figure 2 — National 50,000-S series Syntech (Modified)

Note: This application shows that National seals may be used under conditions more severe than intended. However, before exceeding seal performance specifications, discussion with the nearest National engineer is recommended.

Dual-Lip Opposed Syntech Seal

National 70,000-S Syntech seals are used in numerous applications where fluids or lubricants must be separated within a housing. Sealing lips are of synthetic rubber, precision-trimmed to a "knife" edge for positive sealing, mounted in opposed position and spring-tensioned. They are capable of continuous operation with zero leakage at intermittent temperatures up to 300°F, speeds to 7,000 F.P.M. and run-out to .030 indicator reading.

External Expansion Leather Seals

National 80,000 series spring-tensioned leather seals are designed for applications where the shaft remains stationary, the bore rotates, and the centrifugal force would impair operation of a shaft-type seal. Use of this external design in such cases often simplifies machinery design and facilitates assembly.

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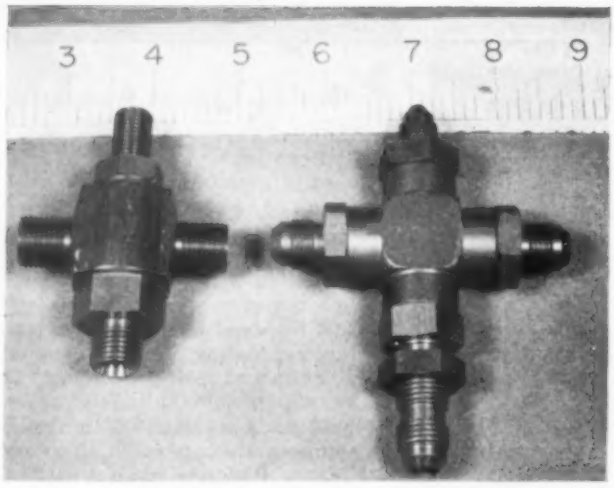
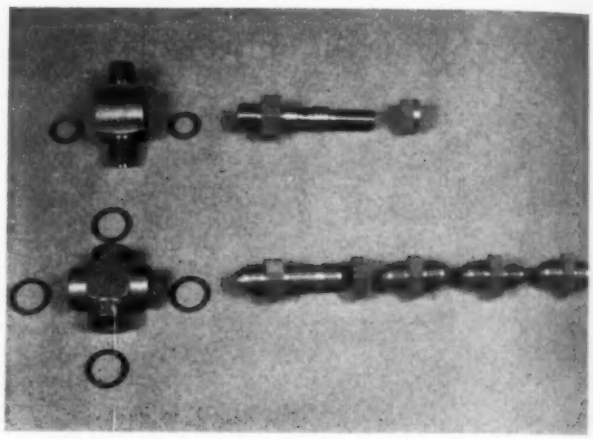


FIG. 5. COMPACTNESS of the cluster fitting cross reduction (left) in comparison with the conventional AN female cross configuration is very evident. The weight saving of the cluster fitting is approximately 30 percent.

FIG. 6. EXPLODED views of detail components of the same fittings shown in Figure 5. Bar stock, "O" rings and total number of cluster fitting parts are one-half those of the conventional female cross arrangement.



to meet the above conditions without the use of manifold blocks designed around existing space availability. These special parts are costly with little chance of reuse; once established the manifold is inflexible for any modification changes that arise throughout production.

Many factors were considered in detail design studies of high pressure fittings in the program to produce a more effective fitting. As a result of these studies, the final design offers many unique and desirable features based on superior sealing methods with less piping and fewer potential leakage points. Ease and reliability of assembly, versatility of arrangement and adaptability for line size reductions, space saving compactness with overall weight reductions are now a reality. By careful application, leakage points can be reduced as much as fifty percent on complicated equipment hookups.

Two Flow Sizes

The overall versatility of the cluster fitting is accomplished by standardizing on only two flow size series with flared or flareless tube attachments. The "low flow" fittings, Figure 1, have a constant ½ inch stem diameter. The "high flow" fittings, Figure 2, have a constant 13/16 inch stem diameter. These flow sizes cover present general requirements. However, if flow requirements increase, a "super high flow" series, based on the same design principle could be made available. The basic styles of stems and manifolds now in production are shown in Figures 1 and 2. Figures 3 and 4 show, respectively, assemblies of the "low flow" and "high flow" cluster fittings. These are manifolding examples, very efficient in the reduced number of sealing "O" rings required for the connection accomplished.

Sealing, compactness and weight efficiency are not limited to manifolding applications; cluster fittings compete favorably against female tee and female cross fittings presently required to accomplish line size reductions. Figure 5 compares a cluster fitting cross reduction with a similar conventional female cross configuration. The compactness of the cluster fitting is evident. Weight saved on this type of application runs approximately 30 percent.

A more detailed comparison of this application is presented in Figure 6, which shows the detail components of each assembly. The "O" ring seals, bar stock, raw material and total number of cluster fitting parts are reduced to one half the amount of the female cross arrangement. Even greater savings are made when more connections are coupled together by a cluster fittings assembly.

The typical cluster fitting may be mounted directly to equipment ports or supported by sheet metal support brackets and structural bulkheads. When mounted to a female port, the sealing at the port is identical to the very reliable straight union type of seal. A high shore hardness "O" ring (AN6290) is placed on the fitting stem adjacent to the threaded size of the stem hex. The stem is screwed into the equipment port and tightened. The metal to metal contact of the stem hex and the port surface provide complete confinement of the "O" ring. This assembly is simple and positive, free of assembly adjustment or angular positioning problems.

When a cluster fitting assembly is supported by a bracket or structural bulkhead, the stem is inserted through a cutout in the support surface. The manifold, with "O" rings installed, is then slipped on the stem and retained by a nut at the end of the stem. The sheet metal mounting brackets may be placed at one or more positions. They can go between the stem

hex and the manifold or between the manifolds on a dual arrangement or between the end manifold and the retainer nut.

Manifold Sealing

Approximately fifty percent of cluster fitting applications are installed on bulkheads and bracket supports. This was an important factor in determining the final position for the manifold sealing "O" rings. These are placed in internal grooves in the manifold, instead of in an exposed position on the stem, to provide greater protection against possible handling and installation damage. Maximum compactness and weight savings are also accomplished by this arrangement.

Sealing between the manifold and stem is accomplished by the "O" ring squeeze and confinement principle as used in hydraulic cylinder design. Manifold side squareness has no effect on this type of sealing. Each manifold has an internal "O" ring groove machined adjacent to each side of the fluid passageway inside the manifold. AN6227 type "O" rings are installed in these grooves prior to the assembly being pushed onto the stem. The AN6227 "O" rings provide reasonable hand assembly loads with a high amount of "O" ring squeeze.

There are no high tightening wrench loads carried through the critical strength sections of the cluster stems. This feature permits the use of light weight aluminum alloy 14 ST material on all sizes of fittings without breakage or yielding. These fittings can be used on low pressure applications with the same weight saving and arrangement advantages available for high pressure application.

Impulse and Vibration Tests

The fluid passage of cluster fitting flow areas are comparable or better than the equivalent conventional fittings and tubing replaced by the cluster arrangement.

Bursting strength of either series of cluster fittings is over 20,000 psi pressure. However, the real test of any fitting is the resistance to pressure impulse and vibration failures. These fittings have successfully withstood severe impulse and vibration tests to prove their suitability for 3000 psi operating pressure applications.

The variety of arrangement of cluster fittings overcomes unexpected space problems and interferences that arise on the original development of congested equipment compartments. The final arrangements are more condensed and easier to install and service. The self aligning feature of the manifold, making it easier to connect difficult lines and the elimination of possible hidden assembly errors have received special favorable comments from production personnel.

In fact, cluster fittings have been enthusiastically received by shop development and production personnel. To quote a phrase used repeatedly by shop personnel, "They're something we've been needing a long time". This is a real tribute to the detailed engineering that went into the new cluster fittings.

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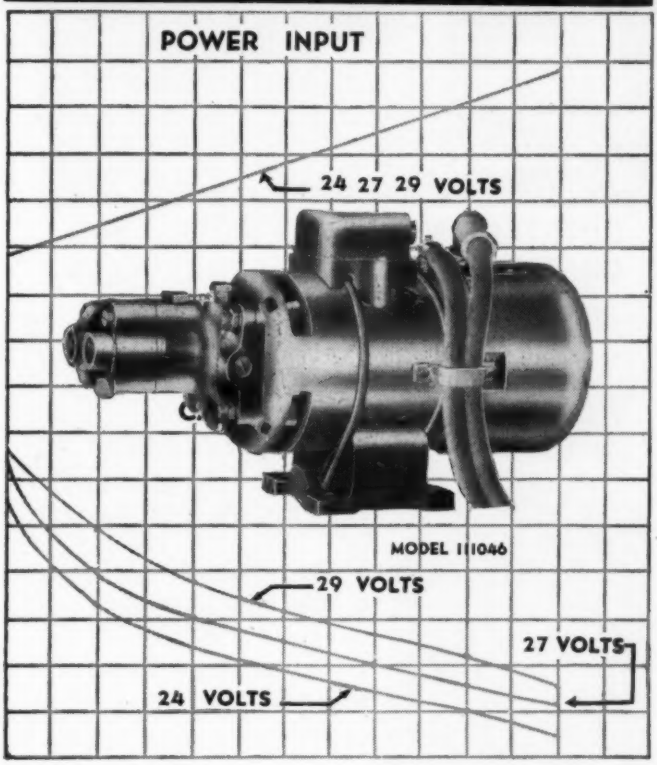

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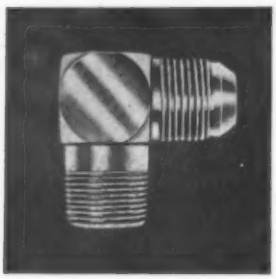

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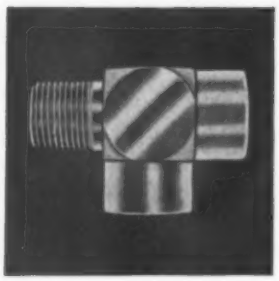

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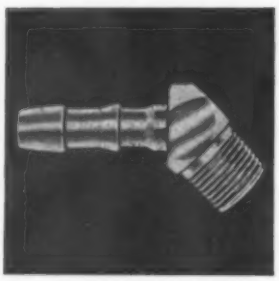

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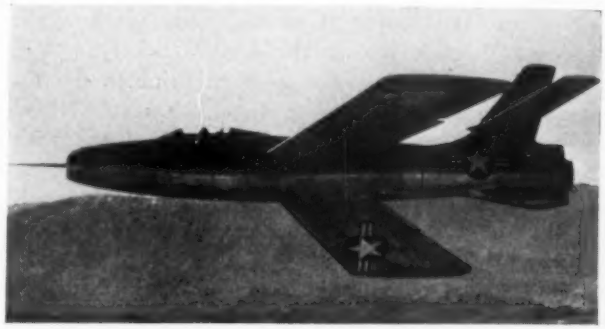
New Supersonic Fighter Has Variable Wing Incidence

THE USAF's new, very high speed, experimental interceptor plane, the XF-91, designed and built by Republic Aviation Corporation, recently completed the first supersonic, rocket-powered flight ever made by an American combat-type fighter. The first flight and an additional series of high speed runs, made from the Air Force's Research and Development Test Center at Edwards AFB, California, were all considered successful. Research flights will be continued indefinitely.

Power for the new plane is supplied by a General Electric J-47, 5200 pound thrust turbojet engine and an afterburner; the auxiliary power for supersonic speeds is furnished by a 6000 pound thrust rocket engine made by Reaction Motors, Inc.



ANGLE of wing incidence on the XF-91 is varied by a hydraulic motor driven screw jack.

Original objectives of the contract aimed at the development of a very high speed, high altitude, interceptor-fighter capable of meeting and defeating any high speed attacking bombers. The XF-91 incorporated several engineering innovations, including the substitution of the reaction motors for rocket engines which were not available when the plane was ready for them. Other innovations involved modification of the afterburner and the installation of a V-shaped tail.

Fluid Motor Controls Incidence

The XF-91 makes use of the principle of inverse taper of its swept-back wings, producing a wing which is wider at the tip than at the fuselage intersection and which houses a tandem-type landing gear.

An outstanding feature is the variable incidence of the wing, permitting a high angle of attack for take-offs and landings and a low angle of attack for high speed flight. The wing, adjustable in flight, is positioned by a screw jack driven by a constant displacement, piston type hydraulic motor. The characteristics of this motor are such that it can be started, stopped

and reversed almost instantaneously, permitting elimination of over-runs and giving exact positioning of the wing.

After the first flight tests, a flight was made in which the wing incidence was operated for the first time. This proved that this feature was entirely feasible from a control standpoint; the wing was operated through its maximum variations with no malfunctions.

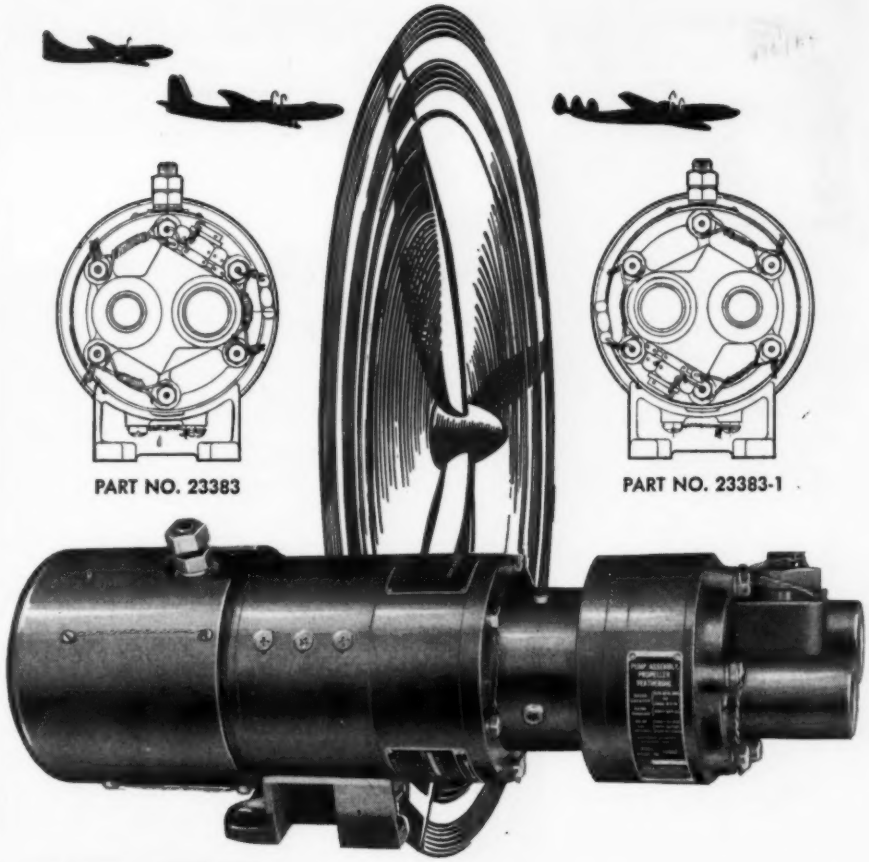
Earlier flight tests showed conclusively that the inverse taper wing successfully reduces wingtip stalls due to loss of lift as is normally experienced with conventionally tapered wing tips. The inverse taper combined with leading edge slots makes it possible to fly the XF-91 at speeds slower than any other jet type fighter, giving the new ship the double advantage of high and low speed performance.

Several stall approaches were made during the first flight; with slots lowered, the stall speed was so low that the "chase" airplane monitoring the flight could not match the pace and flew on past. Lateral control in the stall was full and positive; this was attributed to the inverse taper platform of the wing. The sweptback wing and tail rendered excellent stability under all conditions, while the aileron booster system provided easy lateral control with "good feel" qualities. The tandem wheel landing gear, never before used on a fighter plane, operated properly.

Air Force Now Has 100 Wings

The United States now has 100 Air Force wings in operation and stands at its highest peak of air strength since the end of World War II, according to a statement by Mundy I. Peale, president of Republic Aviation Corporation, made at a luncheon meeting of the "Poor Richard Club" in Philadelphia.

With the 100th wing to become operational, most of them equipped with first-line jet aircraft, the nation now has a total of between 10,000 and 12,000 military airplanes. Under present production schedules, the Air Force will reach its goal of 143 wings by 1955 or early 1956, and will have between 25,000 and 27,000 operational military planes, including reserves.



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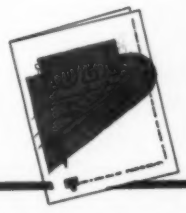

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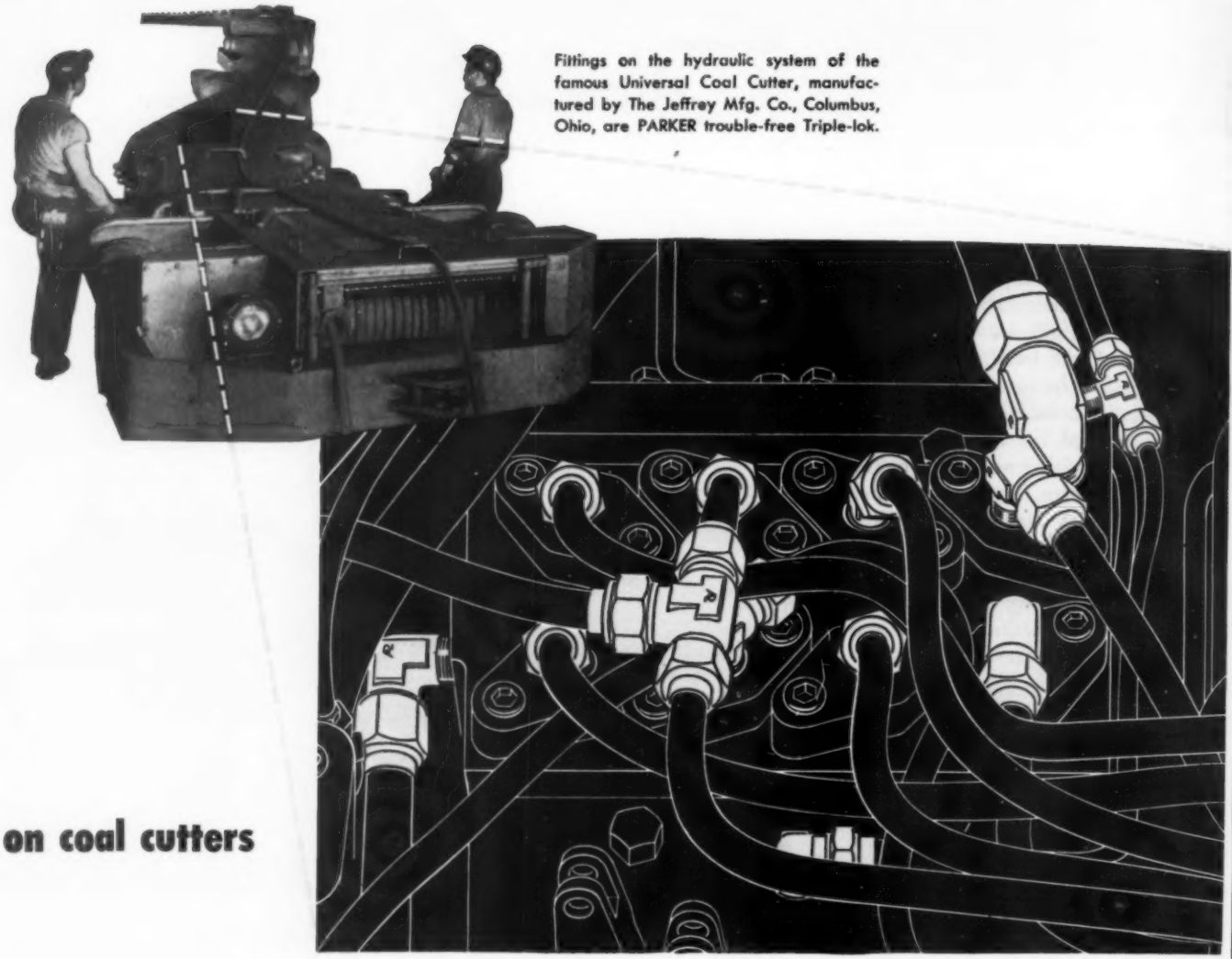

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Gibson Engineering Holds Successful Technical Conference

Left to right: Harold Heming, Gibson Engineering; Vincent Blecker, Eagle Signal Corporation; Charles Gibson; Ernest Bosselman, Gibson Engineering; Paul Reed, APPLIED HYDRAULICS; William Gibson, Gibson Engineering; Frank Flick and Bruce Rasmussen, Miller Motor Company; Richard West, Taco West Corporation; and Joe Clancy, Gibson Engineering.

THE first Annual Southern New England Technical Conference, held at Rock Ledge Country Club, West Hartord, Conn., on Wednesday, January 28th attracted about 125 representatives of industry to hear an outstanding program on the general theme of control of hydraulic and pneumatic equipment. The Conference was sponsored by Gibson Engineering Company.

Three authorities, each well known in his field, gave papers. Richard K. West, President and Chief Engineer, Taco West Corporation; Vincent Blecker, Chief Circuit Engineer, Eagle Signal Corporation; and Frank Flick, President and Chief Engineer, Miller Motor Company were the speakers. Display boards, slides and the blackboard were used to advantage in keeping subject material on a practical plane. The discussion periods were actively engaged in by the technical and administrative personnel who attended.

A cocktail hour and dinner followed the Conference proper. William "Gibby" Gibson, in his concluding remarks promised that the reaction of those attending would determine plans for succeeding Conferences.

Mr. West's subject, "The Practical Use of the Magnetic Amplifier in Instrumentation" was well received. He outlined the development of the magnetic amplifier and the place it is making for itself in the industrial control field, pointing out that the magnetic amplifier has accelerated the trend toward smaller, simpler and more flexible units. He described and displayed the major types of instruments available and illustrated representative applications.

Timing Devices

Mr. Blecker gave a very thorough presentation of the "Application of Timing Devices in Modern Industry." He used the blackboard liberally to trace out typical circuits of timers, reset timers, repeating cycle timers and multiple circuit program timers. He displayed slides which illustrated a wide variety of applications, many of them in New England. Keen interest was evidenced by the range of questions in the discussion period.

Mr. Flick spoke on "Today's Industrial Development and Use of Pneumatic and Hydraulic Circuits." Because of the pressure of time, he departed from his prepared talk and gave an impromptu review of the

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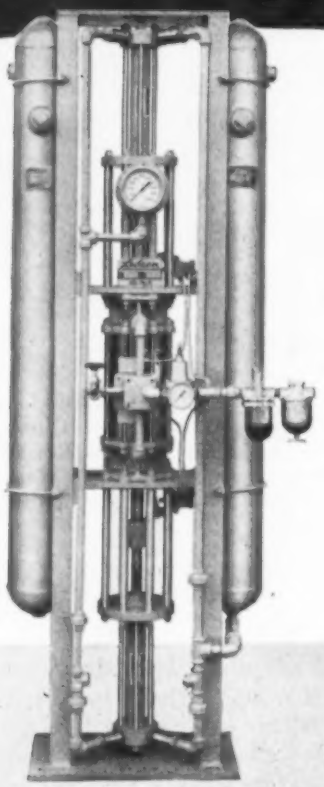


Ledeen
PUMPS

Ledeen Heavy Duty Pumps and Power Units are built for operation of clamps, valve actuators, forming or drawing presses, safety installations, high pressure testing and other hydraulic circuits requiring adjustable pressure and volume and long pressure-holding cycles, without overheating the oil. Built as a complete package power unit, ready for easy installation, requiring connections only to incoming air line and outgoing hydraulic lines. Available in horizontal construction for minimum head room, and vertical construction for minimum floor space. Simple to install. Inexpensive to operate.

Write for Bulletin 4000

VALVES • CYLINDERS
AIR-HYDRAULIC PUMPS & BOOSTERS
VALVE ACTUATORS • AIR HOISTS

Ledeen Mfg. Co.
1610 So. San Pedro
Los Angeles 15, Calif.

Continued

basic performance characteristics of cylinders and emphasized their widespread use in industry.

He defined a cylinder as a device that moves back and forth in a reciprocating motion. They merely require a suitable means for delivering the proper volume and pressure of oil at first one end then the other of a cylinder. Citing as advantages of cylinders the great concentration of power in a small space (a 2-1/2 inch hydraulic cylinder, operating at 2000 psi produces 5 tons of force is about 5 sq. in.) and the infinite variability of stroke

Dick West

length and speed of operation, he emphasized that cylinders had freed designers of the intricate, costly job of laying out and building mechanical drive mechanisms.

Listing the performance characteristics of a good cylinder, either pneumatic or hydraulic, from the standpoint of a user, Mr. Flick outlined the qualifications of an "ideal" cylinder. Such a cylinder would: 1) have no leaks; (2) have no adjustments; (3) have zero break loose; (4) not wear out; (5) not breakdown; and (6) not require preventive maintenance. He pointed out that cylinder manufacturers come pretty close to producing such cylinders.

Mr. Flick described a very simple, inexpensive test setup that any plant, even the smallest can afford, which can be used to give definite answers. The equipment consists of a pressure regulator, a gauge (preferably low pressure), a couple of hose fittings and a bottle of water. To test

Vincent Blecker

for leaks, attach the pressure regulator, gauge and flexible hose air line to one end of the cylinder and run the piston to the end of its stroke. Attach the other hose to the opposite port of the cylinder and submerge the open end of the hose in the water. If no bubbles appear, the cylinder is leakproof. The procedure can be reversed to test the other end of the cylinder. The rod packing can be similarly checked for leakage. The pressure gauge can be used to check for low break loose. He advocated non-adjustable flexible seals, primarily because of the lack of trained men to make adjustments.

Friction, the main cause of wear,

Frank Flick

shortens cylinder life. The break loose point is an index of friction. Low friction gives long life and high efficiency. Low break loose (1 to 2 psi) will have very high efficiency at 80 psi or higher (98 percent or more).

He stated that the recent JIC Hydraulic Standards meeting approved

a wider use of flexible packings in hydraulic cylinders; that cup, U and other flexible seals give exceedingly long life, without any service. Material specifications, rather than performance specifications, are concerned when considering breakdown. Cast iron heads and caps are no longer safe against breakage with increased inertia loads of higher pressures and greater speeds. Ductile materials— solid steel bar stock heads and caps of cast steel should be used wherever possible to get away from the danger of breakage, one of the major problems of breakdowns.

Preventive maintenance has been greatly reduced by specifications calling for hard chrome plating of piston rods and, when necessary, cylinder walls. Both hardened and chrome plated piston rods may be necessary when the cylinder is not in a shielded area. Dirt wipers are absolutely essential because, even with a chrome plated rod, dirt will get into the soft bushing material, imbed and form a perfect lapping sleeve.

Cylinder Finish

In a sealed hydraulic cylinder barrel a 15 to 20 micro-inch finish will give very fine service for flexible type seals. In service, the finish is rubbed down to between 5 and 10 micro-inches, sometimes as low as 3 or 4. On air cylinders, barrels must be made of some noncorrosive lining or from noncorrosive materials. Rust will form on ferrous materials when the cylinder is not moving or moving through only a part of the stroke. Rust, picked up after a shut down or by using a longer stroke, will quickly ruin packing and piston and result in a costly repair job.

Records kept on cylinders properly made indicate that very little preventive maintenance is required. Most of the trouble comes from taking the cylinder apart. When necessary, the cylinder should be removed, taken to a shop or maintenance area, where a trained man can do the work. When the average maintenance man takes a cylinder apart, especially on the job, you are inviting trouble.

Paul L. Reed, editor of APPLIED HYDRAULICS, acted as chairman of the Conference.

Molded chemically blown sponge rubber products made to your designs or blueprints. Specially compounded materials retain resilience after long service life. All shapes and sizes to meet your specific requirements. Write today for full facts.

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

Circle 93 on Reader Service Card

USEFUL LITERATURE

You'll find many valuable production and design ideas in publications described here . . . copies will be sent you free without obligation

Continued from page 26

FABRICATED TUBING . . . The advantages of fabricated tubing are listed in a bulletin issued by Olivet Manufacturing Inc. The catalog indicates that fabricated tubing is less costly in nearly every case where flexible lines or pipe can be replaced. Specifications are listed and different types of available tubing are shown.

Circle 184 on Reader Service Card

HYDRAULIC MANIFOLD . . . The Almo Tool Company has prepared a folder on the hydraulic manifold, a control panel for hydraulically operated machines on which valves and controlling units are mounted. It combines the function of many hydraulic oil lines and fittings heretofore carried in tubing. The folder discusses its operation and shows photographs of installations.

Circle 185 on Reader Service Card

CHECK VALVES . . . Waterman Engineering Company has issued an illustrated circular describing a check valve for use in oil, air and water with working pressures to 3000 psi. The circular lists engineering and construction data, shows graphs plotting pressure versus flow, and also gives available pipe sizes ranging from ⅜ to 1 inch.

Circle 186 on Reader Service Card

POWER TRANSMISSION EQUIPMENT . . . A 36 page catalog, No. R-103-A, describing a complete line of products, manufactured by Rockwood Pulley Manufacturing Co. Inc., has been published. The catalog, illustrated with diagrams and charts, covers Vee belts, detachable link Vee belting, pulleys, roller chain, belt lacing, speed reducers and other power transmission items.

Circle 187 on Reader Service Card

PRESSURE PLUGS . . . A 4 page Bulletin, No. 675-2, prepared by Standard Pressed Steel, features the Dryseal thread pressure plug. The bulletin illustrates how it operates, its construction and lists the available sizes.

Circle 188 on Reader Service Card

FLOW CONTROL VALVE . . . Airmatic Valve Inc. has released a Bulletin sheet, No. 4810, which describes flow control valve model FC, designed to control the speed of the piston stroke in a cylinder. The valve is available in six standard pipe sizes from ¼ to 1¼ inches and will control the flow of air, water or oil to 500 psi. Dimensions and specifications are detailed.

Circle 189 on Reader Service Card

"O" RINGS . . . National Motor Bearing Co. Inc. has prepared a new "O" ring Catalog No. 203, giving complete specifications and engineering data. A wide variety of O-rings are covered and fully detailed. Typical illustrations are illustrated to show O-rings used as both dynamic and static seals. This 20 page booklet which is well layed out, should be a useful addition to the design engineers library.

Circle 190 on Reader Service Card

SEAMLESS TUBING . . . A 32 page catalog No. SS50 issued by American Metal Hose Branch of American Brass Company, describes in detail seamless flexible metal tubing. Shown are different types of tubing and their application. The book is well illustrated with cutaway photographs and sectional drawings.

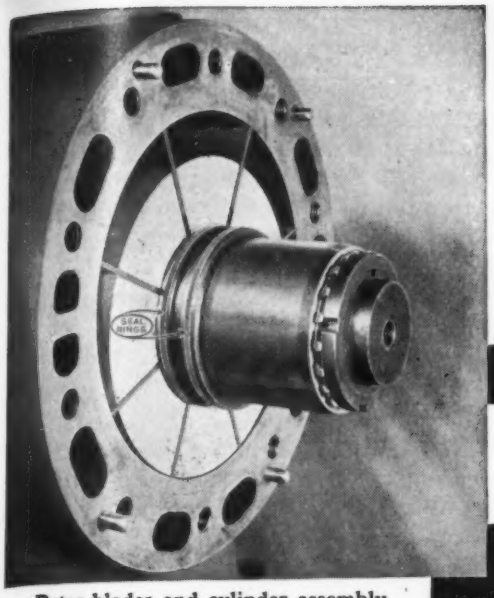
Circle No. 191 on Reader Service Card

CONTROL VALVES . . . Valves designed and built to function as a balanced team and give top performance in dependable air and hydraulic control circuits are featured in Catalog No. 254 issued by Hanna Engineering Works. Detailed and illustrated are hand and foot operated valves, pilot and pilot operated valves, electrically operated valves and speed control valves. Three pages of the catalog are illustrated with typical pilot, manual and electrically actuated fluid power circuits. Thirteen different circuits are shown.

Circle No. 192 on Reader Service Card

ANNUNCIATOR SYSTEMS . . . Catalog 100 covering the improved universal Panalarm "50" annunciator systems, has been issued by Panalarm Products Inc. All of the components in a modern annunciator system together with improvements in mechanical and electrical design are fully described in this 40 page catalog. Recommended standard and ring-back circuits are illustrated in color; charts and engineering data are also shown.

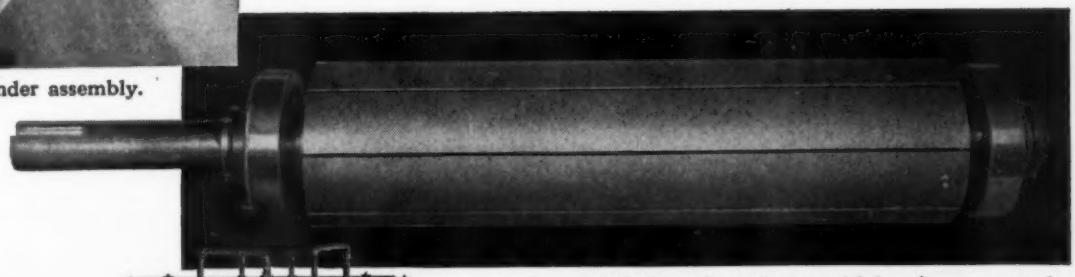
Circle 193 on Reader Service Card



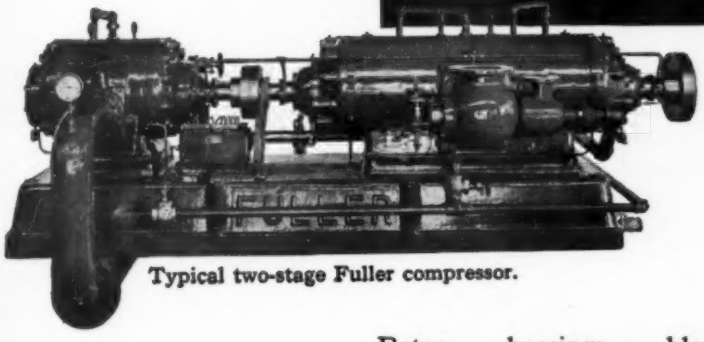
Rotor blades and cylinder assembly.

a lot of maintenance men have never seen inside a

FULLER COMPRESSOR



Accurately balanced, steel rotor with bearings mounted.



Typical two-stage Fuller compressor.

Rotor . . . bearings . . . blades—the only moving parts in a Fuller Rotary Compressor. There you have the three reasons why these compressors keep out of the repair shop. Fuller's efficient "heart" is your guarantee of economical and dependable service.

These are some of the important advantages of the Fuller Rotary—the reasons why thousands of these compressors are quietly and efficiently working for industry today: steady flow—no air-line pulsations, no valves to leak, direct drive from electric motor or internal combustion engine, simple foundation and small floor space, **maintained** capacity and efficiency for the life of the machine.

Whether your requirements call for a single-stage, two-stage or duplex combination, Fuller has the compressor **(to 125 psi. and 3300 cfm)** that will do the job better—longer. Investigate the Fuller Rotary Compressor. Complete information is given in Bulletin C-5. It's yours for the asking.

Fuller

DRY MATERIAL CONVEYING SYSTEMS AND COOLERS • COMPRESSORS AND VACUUM PUMPS FEEDERS AND ASSOCIATED EQUIPMENT

FULLER COMPANY
Catasauqua, Pennsylvania
Chicago 3—120 So. LaSalle St.
San Francisco 4—420 Chancery Bldg.

COMPETITION

is separating the men from the boys right now

• Farm prices dipped 12% in 1952 • Basic industrial sales (defense and non-defense) were off 2% last year • Many permanent facilities placed in operation by industry in 1952 were for defense production only with more to come in 1953.

OEM design now depends on merit to attract the buying attention of the first open market in 12 years. *What is the merit rating of your present designs?*

80% GOOD DESIGN — purpose accomplished

(Oberdorfer has manufactured the world's standard bronze rotary gear and centrifugal pumps since 1897.)

85% EXCELLENT DESIGN — purpose accomplished for the longest period of time

(The length of life of the Oberdorfer 1953 pump is 3 to 5 times that of 1952.)

90% SUPERB DESIGN — purpose accomplished for the longest period of time at the lowest cost.

(Oberdorfer pumps have advanced in price 27% since 1937.)

100% PERFECT DESIGN — yet to be found on earth

(We are looking.)

Oberdorfer manufactures bronze pumps in rotary gear, centrifugal and neoprene impeller designs. *Capacities are from 1 to 150 g.p.m.; pressures are from 1 to 150 p.s.i.*

Let us prove that we can save you money now and in the future — just as we have done in the past for a very substantial cross section of the industrial United States.

See our catalog in Sweet's PRODUCT DESIGN File

OBERDORFER BRONZE PUMPS

Industrial Pump Div., Oberdorfer Foundries, Inc.
534 Thompson Rd., Syracuse, N. Y.

Without cost or obligation, please:
_____ have factory representative call on me
_____ have Oberdorfer design engineer telephone me
_____ send 1953 Oberdorfer catalog

SIGNED_____

COMPANY_____

ADDRESS_____

TELEPHONE NUMBER_____

USEFUL LITERATURE

WIRING MOTOR STARTERS . . . A 24 page wiring diagram bulletin, describing the many ways that the A-B Bulletin 709 magnetic across-the-line starter can be applied, has been prepared by Allen-Bradley Company. Wiring diagrams are shown for all sizes of starters, 1- 2- and 3-phase systems, jogging, two wire control, pump operation, sequence control and many others.

Circle 194 on Reader Service Card

ELEVATOR PUMPS . . . Rotary pumps for hydraulic elevator service are discussed in Bulletin W-487-B9, published by Worthington Corp. The models shown are for smooth quiet operation of hydraulic equipment and have been tried and proven on all types of freight and passenger hydraulic elevator installations.

Circle 195 on Reader Service Card

TUBING SLIDE CHART . . . Carpenter Steel Company has issued a handy slide chart for stainless tubing. In addition to the bending and coiling data it contains, the chart provides ready reference data on physical properties and standard sizes.

Circle 196 on Reader Service Cad

COOLING CONTROLS . . . Sarco Company, Inc. describe in Bulletin 700-A cooling controls of the self operated type. These controls require no auxiliary power such as compressed air, electricity or water to operate them. Also shown are temperature regulators which can be applied to hydraulic systems to regulate cooling water flow through oil coolers.

Circle 197 on Reader Service Card

LIMIT SWITCHES . . . "What Is Your Switch Problem?" is the title of an 8 page booklet prepared by Micro, a division of Minneapolis-Honeywell Regulator Company. The booklet illustrates actual applications of limit switches to machine control problems which range from presses and tapping machines to microfilm recorders. Control of many electrically actuated air and hydraulic equipment is easily obtained with limit switches. Many different styles of switch bodies and operating mechanisms are illustrated.

Circle 198 on Reader Service Card

RESEARCH FACILITIES . . . For those interested in research, development and instrumentation in the fields of nuclear physics, servo mechanisms, upper air research, guided missiles and general electronics, Cook Electric Company has published Bulletin R 10 describing Cook Research Laboratory facilities.

Circle 199 on Reader Service Card

OIL COOLING EQUIPMENT . . . Bell & Gosset Company has prepared a Catalog No. FB-105, outlining the advantages of self-contained oil cooling equipment. The units consist of cooler, pump, strainer, temperature control valves and motor starter, all assembled into a compact, base-mounted unit. Features of construction and materials are described and sectional drawings shown.

Circle 251 on Reader Service Card

PILOT AIR VALVES . . . Technical data, construction and installation methods for the Valvair solenoid pilot air control valve are detailed in Bulletin BP. A cross sectional drawing shows the use of die cast body, stainless steel seats, plunger and spring and Hycar seals. Charted models show voltage, orifice sizes and operating pressures for 2-way and 3-way valves.

Circle 252 on Reader Service Card

HIGH PRESSURE HOSE AND COUPLINGS . . . Avica Corporation makes available a catalog on flexible hose and integral angle hose couplings. These can be used on high pressure hydraulics, die casting machines, machine tools, welding equipment, industrial fluid pumping and other applications. Specifications of the various fittings are listed and illustrated.

Circle 253 on Reader Service Card

Sterlco

Series 150E

TEMPERATURE CONTROL

Keep oil temperature constant with this compact, self-contained, completely automatic, low-cost unit installed in your heat exchange system. Eliminate the human element at the cooling valve. Remember, oil too hot means slippage . . . too cold means sluggish operation and wasted cooling water.

Send for complete details.

MOUNTS AND OPERATES IN ANY POSITION

UPSIDE DOWN

AT ANY ANGLE

HORIZONTAL

UPRIGHT

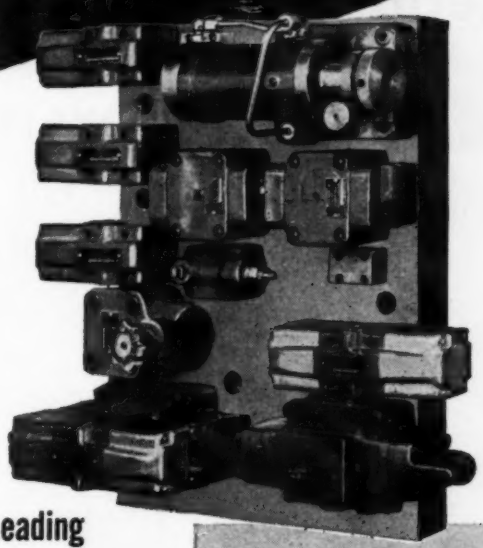
MANUFACTURERS OF TEMPERATURE CONTROL EQUIPMENT SINCE 1918

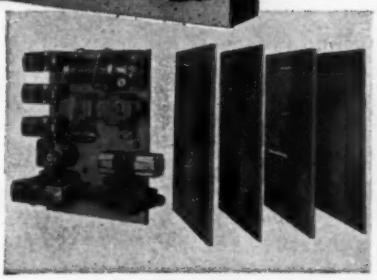
INDUSTRIAL CONTROL DIVISION

STERLING, INC.

3742 N. Holton Street • Milwaukee 12, Wis.

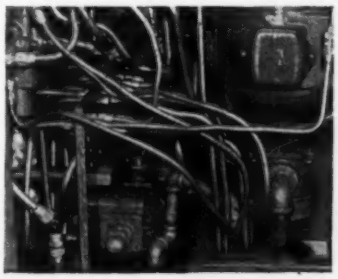
ENGINEER *Simplicity* INTO YOUR HYDRAULIC EQUIPMENT CONTROL SYSTEMS





Leading Hydraulic Manufacturers Are Using Almo Manifolds to Cut Costs and Obtain Permanent Trouble-Free Operation

Almo has perfected the manifold method of channelling hydraulic fluids at high pressures after years of research and can apply it to your equipment. Send a diagram of one of your present hydraulic circuits. Without obligation we will return an Almo Manifold diagram demonstrating how the job can be completely simplified.



This maze of piping and tubing, all subject to failure resulting from vibration and deterioration, can be eliminated and made as compact and simple as the unit illustrated above

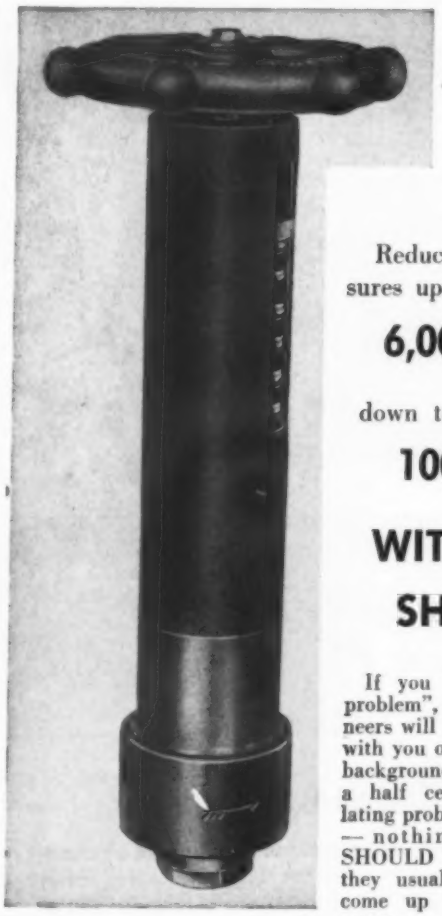
Write for our new brochure

ALMO TOOL CO.

3327 E. VERNOR • DETROIT 7, MICH.

ATLAS

Type "E" High Pressure Reducing Valves



for

WATER

OIL

AIR

Reduces initial pressures up to

6,000 psi.

down to as low as

100 psi.

WITHOUT SHOCK

If you have a "tough problem", ATLAS engineers will be glad to work with you on it. With their background of more than a half century of regulating problems exclusively — nothing else — they SHOULD be helpful, and they usually are able to come up with the right answer.

For Instance

This remarkable Type "E" valve is the result of "tough problems". We found that for the body of this valve there is nothing better than the strongest forged steel. The internal parts that are subjected to the most severe abrasion and corrosion are STELLITED—that is: the main valve and seat ring. Other internal parts are made of hard chromium plated stainless steel. Its balanced construction insures smooth, shock-free control regardless of the highest pressures.

Ask for complete data on Type "E" and, if you have other regulating problems, see the list of other ATLAS products below.

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

253 South St. Newark 5, N. J.

Represented in Principal Cities

Campbell Boiler Feed Regulator
Temperature Regulators
Reducing Valves
Exhaust Control System
Pressure Regulators
Pump Governors
Damper Regulators
Back Pressure Valves
Balanced Valves
Control Valves
Float Valves

USEFUL LITERATURE

Continued

AIR PRESSURE REGULATOR . . . Fisher and Porter Company have issued Catalog 29, describing the constant pressure differential regulator and the instrument air pressure regulator. Both units are fully detailed and illustrated and performance characteristics given.

Circle 201 on Reader Service Card

MOTOR PUMP . . . John S. Barnes Corporation has issued a leaflet describing a complete motor pump. The unit is designed for fluid transfer, lubrication, power tools, material handling trucks and many similar applications.

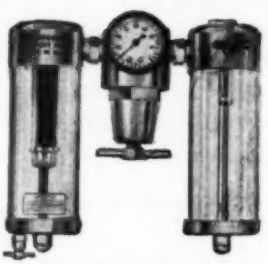
Circle 202 on Reader Service Card

NEEDLE VALVES . . . Data Sheets issued by Fluid Controls Inc. give detailed information on a line of needle valves designed to provide precise control of fluid flow in a hydraulic line. The catalog sheets contain complete engineering, design and construction features, including specific data on pipe sizes, dimensions and performance characteristics.

Circle 203 on Reader Service Card

Prominent User Acclaims

"M-B" Automatic Air Line FILTER, REGULATOR and LUBRICATOR Assembly



The value of "M-B" Automatic Air Line Filters, Regulators and Lubricators is widely known for their effectiveness as a protection to Air Valves, Cylinders, Pneumatic Tools, etc.

"Your 'Sentinel of the Air Line' has been giving us very good service. We have had no complaints at all and I trust that we will be ordering more of them in the near future."

signed: **A. E. Cranston, Sr.**
PRESIDENT

Cranston Steel Strapping Co.
Oak Grove, Oregon

WRITE FOR LITERATURE

M·B PRODUCTS
46 Victor Ave.
DETROIT 3, MICHIGAN

Circle 15 on Reader Service Card

Circle 69 on Reader Service Card

MOTOR CONTROLS . . . Controls, starters, accessories and their applications are listed in a 28 page bulletin. This booklet entitled "Quality Line of Motor Controls for All Industries" published by Allan Bradley Company also features a section illustrating production and design facilities.

Circle 204 on Reader Service Card

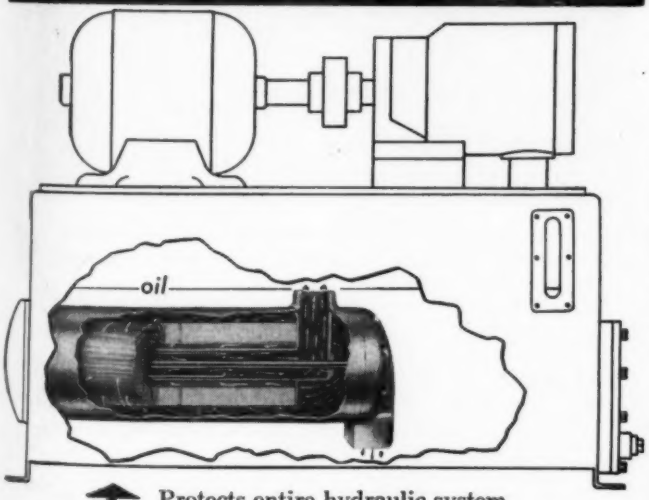
TEMPERATURE REGULATOR . . . The series V self-operating temperature regulators, are the subject of a new 2 color 8 page bulletin No. ST162, offered by the Farris Stacon Corporation. All features of the regulator are detailed, and principles of operation on direct acting—for heating applications—and reverse acting—for cooling operations—are outlined. The booklet also shows other types of regulators from the same series, giving dimension and construction data, and on page 7 a handy selection chart is shown.

Circle 205 on Reader Service Card

TIMER MOTORS . . . Hagen Manufacturing Company Inc. offers bulletin sheets on their small synchronous motor for use in industrial timers. Torque rating for the motor at speeds of one to 360 rpm are tabulated along with voltage ratings. Dimensional data for this motor is provided.

Circle 206 on Reader Service Card

RUCKER MICRONIC FILTER
mounts inside, saves space



Protects entire hydraulic system.
Saves costly piping.
Mounts horizontally or vertically.
Eliminates air leaks and air locks.
Filter elements replaceable without draining tank or removing tank cover.
Overall length 25½"; diameter 8½".

Write NOW for prices and descriptive leaflet containing flow rates and installation data. Dealerships open.

THE RUCKER MAUFACTURING CO.
4516 HOLLIS ST. OAKLAND 8, CALIF. • OLYMPIC 3-5221

Circle 99 on Reader Service Card

the "label" tells you it's unique

no other hydraulic pumps are like

See the Gerotor name-plate on a hydraulic pump and you know what's inside . . . the renowned Gerotor mechanism. Both elements revolve in the same direction at low relative speed . . . minimizing friction, wear and slippage . . . assuring longer life, smoother flow, higher efficiency at lower operating cost. Eleven pump sizes, some engineered for pressures up to 1200 p.s.i. continuous, 1500 p.s.i. intermittent. Specify Gerotor!

Gerotor May Corp., Box 86, Baltimore 3, Md.

GEROTOR
HYDRAULIC PUMPS

Circle 43 on Reader Service Card

control problems ??

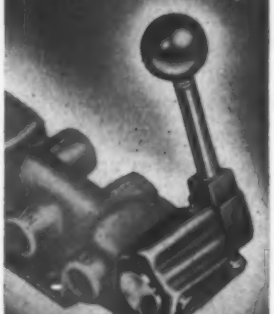
VERSA VALVES will solve them...

Pedal type, four-way shown. Treadle type for full foot support also available.

Foot Actuated

Pilot Actuated

Cam Actuated



Hand Actuated

. . . in ANY application.

From over 1000 standard combinations there is a type and size to suit every compressed air and low pressure water-, or oil-hydraulic valve need. Hand, foot, cam, air or hydraulic pilot actuation for two-, three-, or four-way types in ⅛, ¼, ⅜ and ½ NPT sizes.

. . . in a MODERN way.

For appearance and compactness VERSA VALVES are absolutely unequaled. Functionally designed to do a job, they have no dangerous, dirt-storing projections. For comparison, the height in all sizes is less than 2 inches, and the width for ⅛ and ¼ sizes is 2 inches; for ⅜ and ½ sizes is 2⅜ inches. Lengths vary with type but they all require less space AND you get honest PIPE SIZE FLOW.

. . . EASILY and DEPENDABLY.

VERSA VALVES are engineered and quality produced to give millions of cycles of trouble-free performance. VERSA'S exclusive anti-extrusion arrangement of all kinetic "O" Ring Seals "babies" them into giving impressively long, air-tight service. Installation is simplified by easily accessible mounting holes and a flat mounting surface arranged to clear all connections.

. . . and at LOWER COST.

First cost is lower. Also, maintenance cost is lower because one spool assembly is the only moving valve part. This assures you of long-time, attention-free performance. When service is required, any VERSA VALVE can be completely disassembled with an ordinary screw driver without disturbing pressure line connections.

SEND FOR YOUR FREE CATALOG

A few territories are open for distributors.

VERSA

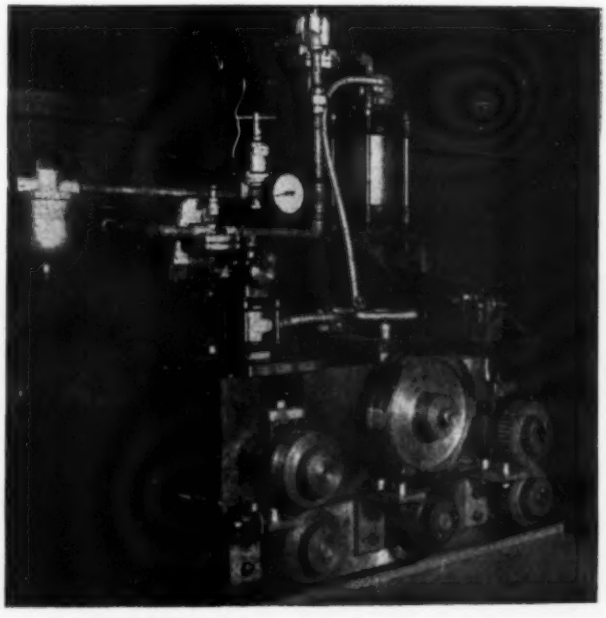
PRODUCTS COMPANY, INCORPORATED

249 SCHOLES STREET BROOKLYN, NEW YORK

Air Loaded Rolls Feed Steel Strapping

MILES and miles of steel strapping are used each year in the packaging and shipping of large boxes. Some of this strapping is smooth, some is corrugated. One of the makers of steel strapping, the A. J. Gerrard & Co. of Melrose Park, Illinois had the machine pictured here built for them to produce trademarked steel strapping in widths from 5/16 to 1½ inch. The strapping will come out either plain or corrugated, or sections in any desired length down to as low as 4 inches can be alternately smooth and corrugated.

To do this job, two pairs of feed rolls are used, one pair is smooth and the other is toothed to produce corrugations. Pressure between each pair of rolls is applied by an air cylinder. An electrically actuated valve at each cylinder acts to load or release the rolls.



FEED ROLLS on the left and right are alternately loaded to produce smooth or corrugated sections in the steel strapping.

With a variable speed electric motor moving the steel strip through the machine at 200 to 400 feet per minute, an accurate timing device must be used when load is applied and released alternately on the smooth and corrugated rolls. An electronic timer is set to control valve actuation on each cylinder.

Steel strip goes through feed rolls at left, under marking die in center and through crimping rolls at right. When smooth strip is desired, crimping rolls at right are retracted; when corrugated strip is required crimping rolls are down and pressure on feed rolls at left is released.

Circle 74 on Reader Service Card

The Biggest PLUS VALUE in Cylinders

For hydraulic pressures up to 1500 or 3000 p.s.i.

They're sturdy—dependable—economical

Use the hydraulic cylinder that will always give you plus performance in your equipment. Designed and constructed to J.I.C. standards, NEPTUNE-POWER PLUS cylinders are available in seven standard mountings—series 1500 for oil and water pressures to 1500 p.s.i.—series 3-1500 for pressures to 3000 p.s.i.

- Bores from 1 to 24 inches —Strokes to 18 feet.
- Pressure ring design permits head rotation to any pipe location.
- Precision fitted piston rings prevent by-pass while offering minimum friction.
- One piece high pressure, self-adjusting, rod packing provides precision bearing and guide for piston rod.
- Single or double end rods, with cushion.
- Other series available for air pressure.

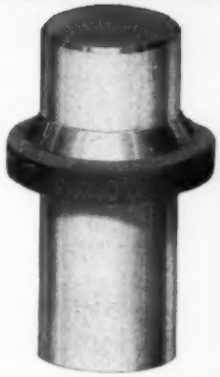
Write for Catalog AH

NEPTUNE-POWER PLUS PRODUCTS CO.

2228 Bellevue Ave. Detroit 7, Michigan

Circle 51 on Reader Service Card

"SEAL-GUARD" METALLIC ROD WIPER



PROTECTS YOUR CYLINDER RODS, MACHINE SPINDLES, GUIDE PINS AND LOCATING PINS

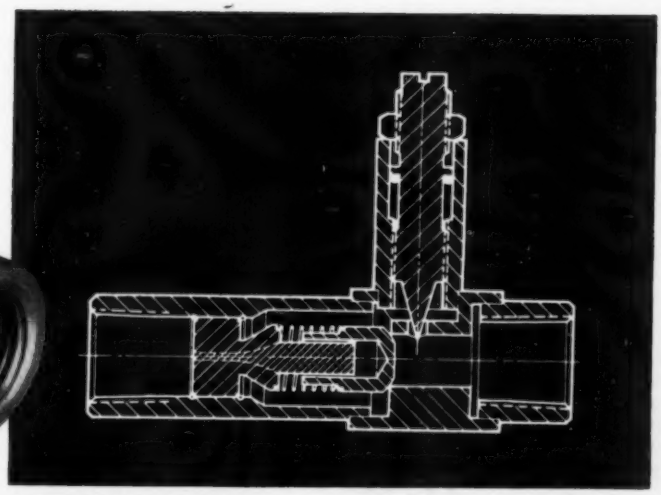
The "Seal-Guard" Metallic Rod Wiper affords permanent protection from falling or flying debris . . . Two flexible bronze rings mounted in synthetic rubber lift off harmful substances completely by means of their knife-edged conical surfaces . . . The device is self-adjusting through action of rubber on staggered scraper rings . . . Rod diameter sizes are from ½ to 10 inches.

Write for Literature

HYDRAULIC ACCESSORIES CO.

24301 HOOVER RD. • VAN DYKE, MICHIGAN

Adjustable RESTRICTOR VALVES



- For Oil
- 50 to 3000 P.S.I. Service
- ¼", ⅜" and ½" Pipe Sizes

- NO EXTERNAL LEAKAGE
- LOW PRESSURE DROP
- EASILY ADJUSTED
- HOLDS ADJUSTMENT

Write today for complete engineering data and specifications

Manufacturers of Hydraulic Valves and Devices—Relief Valves —Check Valves—Restrictor Valves—Needle Valves—Pilot Check Valves—Clamping Valves—Small Spring Loaded Accumulators —Special Valves.

Fluid Controls, inc.

1284 N. CENTER STREET • MENTOR, OHIO

Circle 36 on Reader Service Card

KOBE Heavy Duty High Pressure

Triplex Pumps

Case History A9: **California Rubber Products, Inc., Hawthorne, California manufactures molded and extruded rubber products. Since September, 1946, the Company has used two Size-2 Kobe Triplexes to operate presses. The service is intermittent, 24 hours a day, 5 days a week, at 1900 p. s. i.**

Trouble Free Performance

California's shop superintendent, C. L. Arends, reports trouble-free service from the Kobe units. His enthusiasm is reflected in this statement, "We have only had to shut down once in the almost six years since the Kobe Pumps were installed."

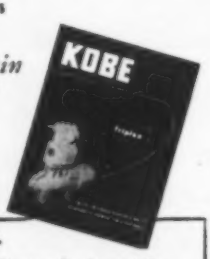
If your problem is hydraulic "power in a package", the package to buy is Kobe.

Triplex Features

- Pressures—To 5,000 psi (standard) To 20,000 psi (special)
- Volumes—To 60 g.p.m.
- Power Ratings—15, 30, and 50 H.P.
- Integral Double Reduction Gears
- Integral Electric Drive (Optional)
- Easily interchanged Plungers and Liners

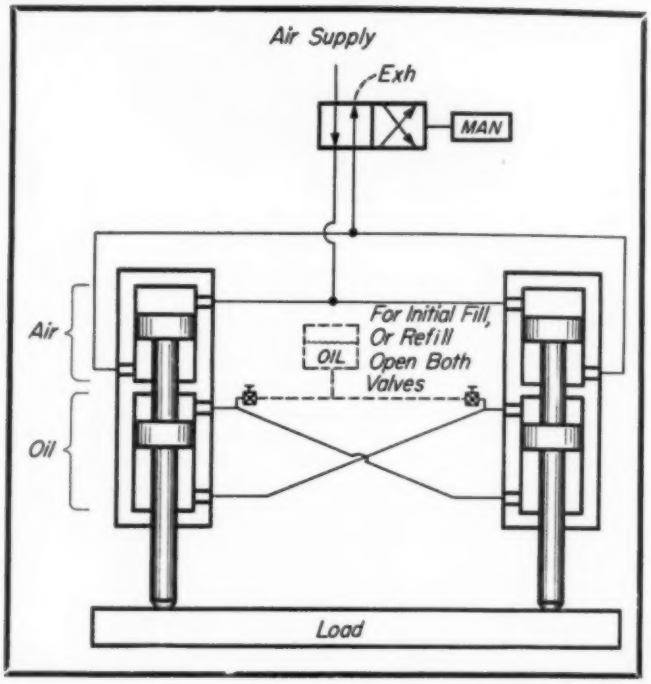
Write for Bulletin

KOBE INC., Division of Dresser Equipment Co., 615 NBC Bldg., 815 Superior Ave., N.E. Cleveland 14, Ohio



KOBE INC.
Division of Dresser Equipment Co.
Plant: Huntington Park, Calif. — Representatives in CLEVELAND, Pittsburgh, New York, Houston, Oklahoma City.

Have You Used This Circuit ... to synchronize cylinders?



RECENTLY we got to talking with Clete Tepas, Miller Motor Company's Buffalo area representative, about some of the circuit problems which sales engineers of air and hydraulic equipment run into. One of the problems which machine builders and tool engineers ask about is the matter of getting two cylinders to move together at the same rate of speed, regardless of load.

There are several methods for synchronizing cylinders. Clete's sketch of an air powered-oil controlled circuit to do the job is shown here.

What makes it tough to synchronize cylinder travel? Because the speed of a cylinder depends on the amount of fluid pumped into it, to get cylinders to move at the same rate of speed, the oil delivery to each cylinder must be equal. Accurate division of oil flow from a pump is not easy to get. It can be done with flow divider valves or with two identical fluid motors. Both of these methods have been used with success. Cylinder bores must be identical. And if there's any leakage, the timing will probably be upset.

Where the power requirements can be met with air, Clete Tepas is sure that the circuit he sketched for us would cost considerably less than a fluid motor circuit. Of course you'll pay more for tandem cylinders than the conventional cylinder. This will balance out some of the savings.

Use Simple Closed Circuit

From the sketch, you'll see that the oil circuit is a simple closed system. A small oil tank with two-way valves initially fills the system. The two-way valves would be opened, and the system cycled, for any makeup that is required. In operation, air is directed to the head ends of both cylinders to drive the pistons downward. Air from the rod end of the upper cylinders goes to exhaust. Cylinder speed is controlled by the rate at which oil in the lower cylinder is discharged. Incidentally, speed control valves could be put in the oil lines if you want more control. Because oil from one cylinder is directed into the opposite cylinder, oil volume is equally divided between cylinders. If one cylinder gets ahead of the other,

for that moment it will deliver more oil than it receives and the opposite cylinder will catch up.

Just how practical is this circuit? We'd like to know how far apart the tandem cylinders can be spaced and still stay in step. We also would like to know how accurate the circuit is. This will be tough to find out because each job has different requirements and are assembled by different people. If you've used this circuit let us know how it has performed for you.

And if you have any other ideas on synchronizing cylinders jot them down and send them along.

Fluid Power Group to Meet in April

THE Fluid Power Systems Group of the Hydraulics Division of the Philadelphia section, ASME, will hold their second regularly scheduled meeting on Wednesday, April 8 at 314 Engineers' Bldg., University of Pennsylvania. Chairman J. S. Bennett, Vice President, American Engineering Company, announces that two well known authorities will address the meeting.

Harry P. Kupiec, General Manager, Aircraft Equipment Testing Co. of Baltimore, Md., will speak on "Problems Relating to Aircraft Hydraulics" and O. S. Carliss, Chief Engineer of Yale & Towne Manufacturing Company, will address the meeting on "Applications of Hydraulic Components to Material Handling Equipment". Following the practice set up at the February meeting, there will be two formal, prepared discussions presented on each paper, after which the meeting will be open for general discussion.

A total of over 100 men attended the February meeting, twenty-five percent of whom came more than 50 miles. In several cases representatives of hydraulic manufacturers arranged business trips so that they could attend. A good sized delegation came from New York.

Mr. Kupiec has had a long, varied experience in hydraulic work in the aircraft field and is a former chairman of SAE A-6 Committee and a long time active member.

Reliant "O" Ring
GROOVE GAGES
Dimensional Control of internal "O" ring grooves.
Also use as a dial bore gage - taper - blind holes.
Checks standard ranges ⅛ to 4⅞ accurately and quickly.
Checks out of round - recesses - spherical radii.
Low in cost.
Sold only through industrial distributors.
Reliant Industries
4947 FIRESTONE BOULEVARD
SOUTH GATE, CALIFORNIA

where others won't!

In close quarters, an O-M Cylinder really shines because it is ALL CYLINDER! The *interlocking mechanism,* which does away with tie rods and projecting end caps, means that *more power is packed into less space.* Saves up to ⅓ installation space. Also provides perfect alignment, friction-free performance. Easier to install and repack. End plugs tapped for universal mounting . . . with a complete range of mounting brackets, interchangeable bore for bore. All machined steel, with bearing bronze (no castings)—easily turned down to fit in deep recesses of machines or bases. Available in full range of sizes (1½" to 8" bores) with standard, 2 to 1 or oversize rods. *Completely interchangeable parts.*

14-DAY DELIVERY ON MOST SIZES

Send today for FREE catalog and complete set of ½ and ¼-scale templates showing all cylinders and mounting brackets.

MAIL COUPON NOW!

ORTMAN MILLER MACHINE CO.
1204 150th Street • Hammond, Indiana

☐ Please send latest O-M catalog.
☐ Please send complete set of templates.

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Company.....
Address.....
City.....Zone....State.....

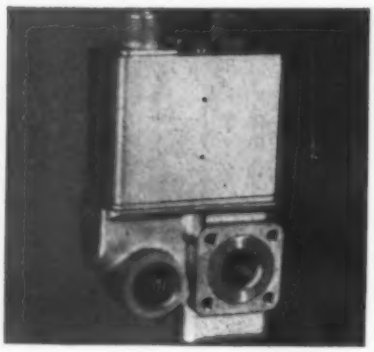
Circle 92 on Reader Service Card

Circle 79 on Reader Service Card

NEW PRODUCTS

Components, tools and equipment designed to improve operation of fluid power systems are described here . . . for more information fill in and mail the post card bound in this issue.

Continued from page 49



SOLENOID VALVE

Designation: V-400-3 and V-500-3 Double Vent Solenoid Valves.

Features: Provides failure-proof control of pressuried air in aircraft fuel systems when fuel is transferred from the auxiliary tank to the main tank. This is accomplished by a control system which operates with compressed air at 15 psi heated to 450 degrees C. The valve controls the passage of the pressurized air from the compressor to the auxiliary tank. After the tank is pressurized the opening of any fuel valves allows fuel to be transferred to the main tank as desired. Each valve has its own electrical energizing unit, which withstands shock, moisture, heat, cold and the elements.

Valcor Engineering Corp.
Newark, N. J.

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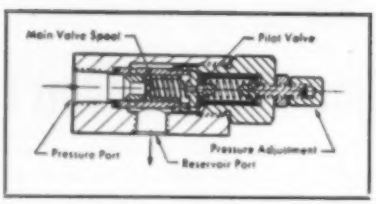

RELIEF VALVES

Sizes: Available in ¼ and ⅜ inch. Gross weight from 12-15 ounces.

Design: New sliding spool design of the main valve provides increased capacity to handle any flow that could be reasonably supplied through matching fittings. Relief pressure is constant and not noticeably effected by flow, temperature or viscosity.

Applications: Used on farm machinery, machine tools and road machinery.

Fluid Controls, Inc.
Mentor, Ohio

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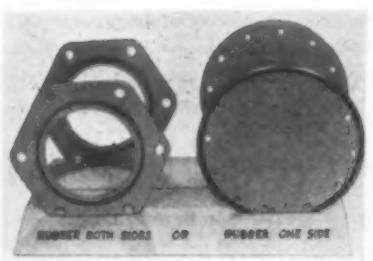


STATIC FACE SEAL

Designation: Gask-O-Seal

Desgn: Consists of a flat metal surface and a machined groove into which a rubber sealing gland is mechanically bonded.

Feature: There is no cold flow under either high or low pressures. Provides a perfect seal with low bolt torque which means that heavy reinforcement of flanges is not necessary, resulting in a considerable net weight saving. The rugged one-piece construction allow re-use.

Franklin C. Wolfe Company
Culver City, Calif.

Circle 147 on Reader Service Card

MULTI-CONTROL VALVE

Designation: Model VP

Capacity: 24 gpm, adjustable from pressures of 20 to 1250 psi.

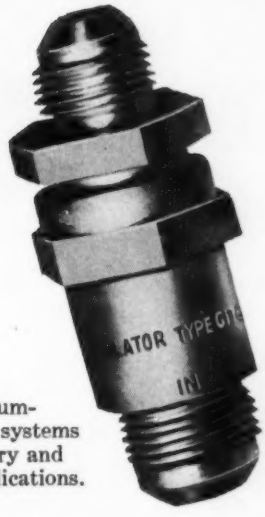
Features: To actuate two double or single acting cylinders or a combination of one single and one double acting cylinder. The valve is notable in being effortless to operate through the entire pressure system, even at pressures of 1250 psi. High pressures within the valve are always equalized and balanced, thus preventing the unit from becoming locked in any position.

Applications: For farm machinery, road machinery, materials handling and drilling machinery, mining machinery and many other applications.

Gre-Sen Manufacturing Company
Minneapolis, Minn.

Circle 148 on Reader Service Card

for high-pressure systems.



for medium-pressure systems in military and tool applications.

replaceable element type, for hydraulic tool applications.

for aircraft hydraulic systems.

for low-pressure, high flow systems.

When filter performance really counts... specify PurOlator

For many years, Purolator* filters have been specified as standard equipment in hydraulic systems where failure might mean disaster . . . as in military and commercial aircraft.

Why not take a tip from the nation's leading plane designers, then—and specify Purolator filters in *all* hydraulic systems containing precision valves and actuators. Purolator hydraulic filters remove contaminants that are the most common cause of valve and piston failure—sludge, oxidation by-products, rust and metal particles.

And remember . . . whenever you specify Purolator, your choice is backed by the world's largest filter research and engineering laboratories, *plus* the world's largest specialized filter production facilities.

Send for the Purolator Industrial Filter Catalog, listing more than thirty different types, including A & N approved filters.

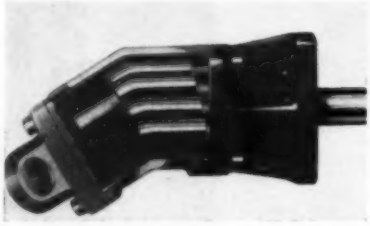
*Reg. U. S. Pat. Off.

PUROLATOR
WORLD'S FINEST OIL FILTER

Continued

POSITIVE DISPLACEMENT PUMP

Designation: Model 100
Design: There are 9 sleeves which extend into each of two cylinder blocks whose angular relation to each other causes a telescoping cylinder effect when the cylindrical blocks are rotated. There are no connecting rods, cams or springs. Body of bronze or aluminum; the aluminum is specially treated to resist corrosion. Pump is designed for face mounting.



Features: Light weight, capable of meeting a wide range of volume and pressure requirements which, heretofore, necessitated a variety of pump sizes. This pump delivers from 2.4 gpm to 7.2 gpm at pressures from 9 psi to 433 psi (1000 head feet), depending upon the speed at which it is operated and the power applied.
Application: Pumping successfully fresh water, salt water, oil, gasoline and other liquids.

Eastman Pacific Co.
Los Angeles, Calif.

Circle 149 on Reader Service Card

3 Advantages are YOURS if you use . .
UNIVERSAL
(THE ORIGINAL)
POROUS STONE
AIR FILTERS
IN YOUR COMPRESSED AIR LINES

A MILLION PORES are present in a 4" diam. stone—used in a ¾" size unit.

MADE FOR 6 PIPE SIZES
¼" ½" ¾" 1" 1½" 2"

1 Employ centrifugal action to secure complete separation of the larger particles of oil and water from compressed air and a minutely porous synthetic stone to remove the final traces of condensed water and oil.

2 They actually FILTER the air through the innumerable zig-zag pores of the stone of the tiniest particles of extraneous matter.

3 They're the EASIEST Filters to maintain. Simply remove one cap screw and loosen the other three, without disturbing the piping, and remove the stone for cleaning in oil solvent. The stones last indefinitely. Maintenance reduced to a minimum.

TWO STONES—2" in thickness but of varying diameters to fit different filter sizes—supplied with each Filter unit.

they INSURE PURE, DRY, OIL-FREE COMPRESSED AIR

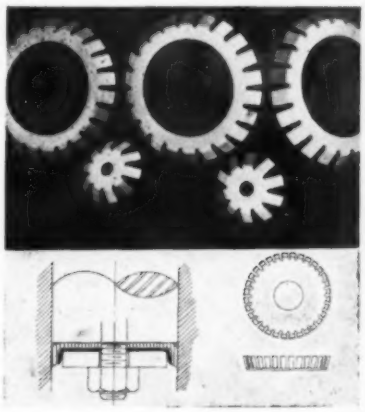
Designed so that flow of air is UPWARD through the filter stone. When air is shut off the pull of gravity aids in drawing condensation and oil down to lower chamber for escapage through drain, hence stones require less frequent changing. Universal Air Filters are applicable to every type of industry.
The ORIGINAL Porous Stone Air Filter

UNIVERSAL FILTER CO., INC.
7021 MANCHESTER • ST. LOUIS 17, MO.
Name .....
Address .....
City ..... State .....

SEND THIS COUPON TODAY for COMPLETE INFORMATION

PACKING EXPANDER

Designation: Series ES-11
Sizes: For use with all standard hydraulic and pneumatic packing diameters from 1 ¼ to 2 ⅞ inches.
Features: To eliminate leakage in hydraulic and pneumatic cylinders. The expanders insure positive sealing of cup packings



at all times by exerting controlled pressure on the packing lip so that it maintains constant contact with the cylinder wall. These cup expanders can be quickly and easily installed; they eliminate the need for special adapters or design changes on clamping plates or other parts.
Applications: For use on pumps, compressors, hydraulic presses, jacks, air cylinders, feed mechanisms, lubricators and other components.

HPL Manufacturing Company
Cleveland, Ohio

Circle 150 on Reader Service Card

Engineered to fit your Hydraulic Systems...

. . . 500 Series

PUMPS

Among the 185 stock pumps offered by Brown & Sharpe you'll usually find one that meets your needs. For example, this 500 Series—for hydraulic installations—gives you a choice of six convenient sizes with capacities up to 37.6 gpm. and up to 500 psi. pressure . . . saves you the cost, time, and trouble of special engineering.

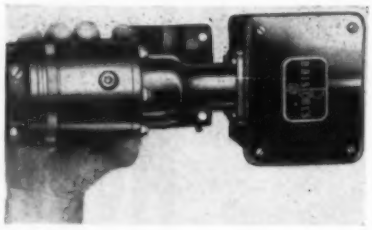
Features of the 500 Series Pumps include: quiet, efficient, heat-treated gears designed to reduce end thrust; long-wearing needle bearings; oil-tight, ground, housing joints; reversible back-drain allows changing direction of rotation; suction and discharge ports on ends and sides of pumps provide convenient piping combinations; adaptable flanged stand that meets practically all mounting needs. Write for complete, 32-page, Pump Catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

Brown & Sharpe BS

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Continued

MINIATURE PNEUMATIC TRANSMITTER



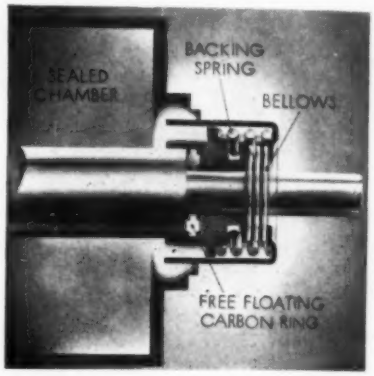
Designation: Series 650
Design: Uses standard measuring elements and a simple transmitting mechanism with only one pivot and no flexures. Friction and lost motion are thereby eliminated for all practical purposes. The transmitter weighing 7½ pounds is weatherproof and can be installed in any location and will operate in any position.
Application: For measuring and transmitting readings of temperature, pressure, vacuum and differential pressure.

The Bristol Company
Waterbury, Conn.

Circle 151 on Reader Service Card

METALLIC BELLOWS SHAFT SEAL

Features: Can be used on shafts as small as ¼ inch diameter. Permits free turning of the shaft to accomplish movement within



the sealed casing while maintaining the hermetic seal unimpaired.
Applications: Suitable for sealing the control shafts of hermetically sealed equipment such as electronic, industrial and military instruments.

Clifford Manufacturing Company
Waltham, Mass.

Circle 152 on Reader Service Card

AIR DRIER

Designation: Model 200.
Features: Removes moisture, oil, dust, dirt, smoke, scale from compressed air and gases; reduces humidity below condensation point; acts as storage tank.
Construction: Built in cylindrical tanks, the larger models standing on rigid bases, and the smaller sizes equipped with wall brackets. Each unit has an inlet pipe welded tangentially near the bottom of the side wall and an outlet pipe near the top. All units are finished in highest quality machinery enamel.
Applications: In compressed air lines for air-operated tools, in-

✻ Whether heavy-duty or light-duty, high-speed or low-speed, from oil burners and blowers to pumps and agitators, there is a LOVEJOY Flexible Coupling to meet your exact requirements. They offer the best obtainable insurance against alignment troubles —dampen and absorb starting torque, vibration and shock of intermittent loads . . . protect motor and driven machine . . . lengthen bearing life.

LOVEJOY Flexible Couplings are compact in construction, durable, and provide excellent resiliency. Bodies carefully machined. Cushions available in materials suited to the particular load conditions . . . can be changed without shutdown. No lubrication needed.

● *Write today for illustrated catalog with handy selector charts.*

Also Mfrs. of Lovejoy Universal Joints and Lovejoy Variable Speed Pulleys.

LOVEJOY FLEXIBLE COUPLING CO.

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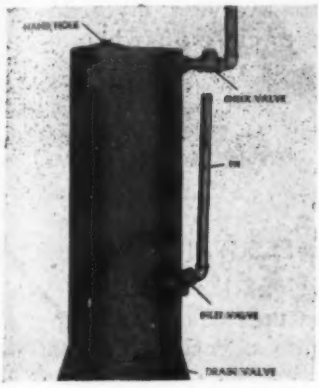
strument controls, paint sprayers and sand blasters. In drying



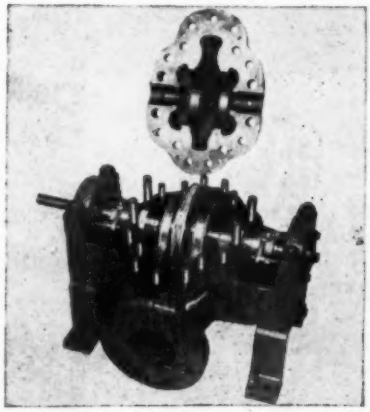
of tanks in chemical and paint factories; pipe systems etc.; and in liquid agitation and displacement.

Van Products Co.
Erie, Pa.

Circle 153 on Reader Service Card

CENTRIFUGAL PUMPS

Designation: Fig. 3405.
Design: Renewable stuffing box bushings, sealed bearing housings, cowl-type glands suitable for use with quenching liquids, stainless steel impeller keys, Teflon water seal rings and corrosion-resistant gland bolts. Bearing spans have been kept to the shortest practical distance, resulting in overall savings in length.
Construction: Pump casings are horiontally split, and removal of the upper half permits inspection, maintenance, and removal of the entire rotating element without disturbing the suction and discharge piping, or pump and driver alignment.
Features: There are three different assemblies of shafts and rotating parts. The wide interchangeability of parts in each assembly makes it possible to provide 19 different pump sizes in three groups. In addition, a locking design of shaft sleeves makes it possible to change the direction of impeller rotation and thus 38 different pump combinations are offered in the new series.
Capacities: Ranging from 200 gpm to 6400 gpm, with heads up to 260 feet.



Goulds Pumps, Inc.
Seneca Fall, N. Y.

Circle 154 on Reader Service Card

FLOW LIMITER VALVES

Design: Poppet is held normally open by the spring which yields instantly as the pressure drop around the poppet head reaches the desired maximum flow rate, causing a floating O-ring to seat between two conical surfaces. Exact repeatability, together with positive dead-tight closing is achieved. These valves are

Bruning

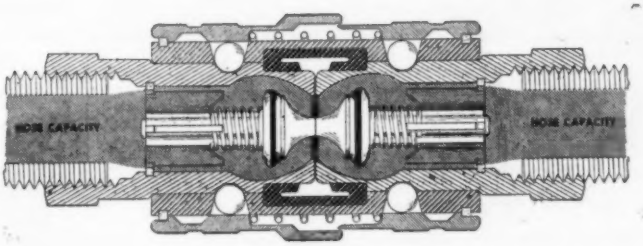
QUICK-DISCONNECT COUPLERS

QUICK-SIMPLE-POSITIVE COUPLING AND UNCOUPLING

There is no spurting or loss of oil either when coupling or uncoupling. No oil gets out—No dirt gets in.

SIMPLE AND POSITIVE "AUTOMATIC BREAK-AWAY"

Available for either single or multiple line systems. Standard or pressure couplers easily convert to "Automatic Breakaway."



FULL FLOW, POSITIVE SEATING VALVE DESIGN

Specially designed patented sealing system. Guaranteed not to leak either coupled or uncoupled.

SIZES AND TYPES FOR EVERY APPLICATION

Full capacity couplers for all line sizes from 3/8" to 1".

EASILY COUPLED OR UNCOUPLED WITH FULL PRESSURE ON THE LINES

No special tools, gadgets or brackets required. Easily coupled by hand to 3,000 PSI.

SYSTEM COMPLETELY SEALED AND PROTECTED WHEN DISCONNECTED

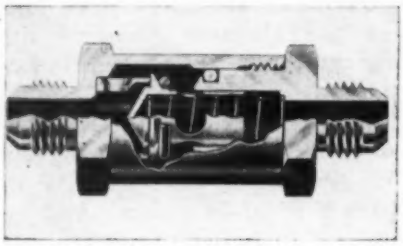
No oil gets out—No dirt gets in. No special caps, plugs or other gadgets needed.

THE BRUNING COMPANY
Lincoln, Nebraska

Continued

manufactured with male tube or pipe connections on the discharge side in the restricted flow direction, and with either male or female connections on the inlet side.

Operation: Allows flow in one direction up to a pre-determined rate but shuts off quickly and tightly to prevent higher flows, while allowing unrestricted flow



in the opposite direction. Designed as an excess flow or flow limiter valve and serves equally well as an automatic drain or dump valve. Valve can be preset to close off when any given rate is reached.

James-Pond-Clark
Pasadena, Calif.
Circle 155 on Reader Service Card

ELECTRICAL CONDUIT

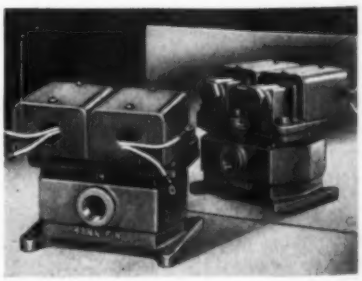
Designation: Sealtite Type UA
Features: Tough, extruded synthetic covering protects wiring against moisture, oil, dirt, chemicals and corrosive fumes. The conduit is made of spirally wound, interlocked zinc-plated

steel strip with a copper bonding conductor wound spirally in the space between each convolution on the inside of the conduit. Light and flexible, can be cut to required length, bends easily.
Sizes: Available in long length in nominal ID sizes ⅜ to 1¼ inches.

American Brass Company
Waterbury, Conn.
Circle 156 on Reader Service Card

DUAL 3-WAY AIR VALVE

Designation: The P-M Series BB-5; offered in ¾ inch I. P. S. only.
Design: The two solenoids are connected in parallel in the elec-



tric circuit on the press. Pilot sections are interlocked pneumatically so that, if either solenoid fails to operate, the valve will not build up enough pilot pressure to operate either main valve and the press will not

Specify Lindberg Air or Hydraulic Cylinders for dependable, low cost power for lifting, forcing, pulling, pressing, pushing and clamping. Lindberg Cylinders feature rotatable heads, self-adjusting piston rod packing, and socket head cap screws.

Ask for bulletin No. 701, "Lindberg Hydraulic Cylinders" . . or No. 731, "Lindberg Air Cylinders."

AIR . . HYDRAULIC
LINDBERG CYLINDERS

Lindberg Engineering Company,
2441 West Hubbard Street, Chicago 12, Illinois

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S-T-R-E-T-C-H the service life of high-cost components with

HYDRO-WYPE AN-6231-A SCRAPER RINGS

Our Hydro-Wype Scraper Rings wipe piston rods clean of dirt, dust, ice, shavings and foreign materials to prevent damage to "O" or "V" ring packings, cylinder walls, etc. Made to highest precision standards. Pre-stressed design assures metal-to-metal fit with minimum interference and breakout pressure. Tested and proved at over 2,000,000 cycles—*more than 20 times the requirement under MIL-S-5049.* Successfully used in hydraulic or pneumatic cylinders and actuators, aircraft controls and many other applications. Write ATSCO for complete catalog.

AN6228 and AN6229 "V" RING ADAPTERS

Gadgets, inc.

DEPARTMENT H
3629 N. Dixie Drive
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ATSCO *(Associated Technical Sales Company)*

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SAVE UP TO 85%

NEW INSIDE – OUTSIDE VERNIER CALIPERS
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MICROMETERS – 0" to 1" in 1,000ths. Has lock-nut & ratchet ...ONLY – ... 9.75

STAND MAGNIFIER
Handy stand magnifier with universal adjustments. Overall height: 6". Has powerful, clear magnifying lens. 1.49

BENDIX HYDRAULIC PUMP & MOTOR
Has 3-1/2 GPM capacity at 600 PSI. Motor is 1½ HP, 24V, D.C. Will operate on either 12 or 32V, DC current. Has built-in relief valve adj. to 1500 PSI. This unit ideal for hyd. lifts, portable loaders, etc. 19.50

MAGNETIC BASE–INDICATOR HOLDER...
A time saver for precision checking. Magnetic base fits curved or flat surface. Has 45-50 lb. pull. Stainless steel 6½" rod mounted in ball socket permits universal settings 3.95
Note: We have complete line of instruments, depth gauges, inspection mirrors, etc. WRITE TODAY

HYDRAULIC HAND PUMP
Operating pressure 2000 PSI. Cap., 1.5 cu. in per complete cycle .. 12.75

GEAR HEAD MOTORS
Heavy duty, G.E. Gear Head motor. 2 HP, 24V. DC, 125 amp., reversible motor drives a reduction gear unit giving 36 to 1 ratio at take-off. Also will operate on 6 or 12 volts.
MOTOR ALONE 9.95
GEAR BOX 7.95
36 to 1 G.E. (306 shaft RPM)
20 to 1 Eclipse (130 shaft RPM)
40 to 1 Eclipse (110 shaft RPM)
10.95 EA.

HYDRAULIC ACCUMULATORS
A-2B FLOATING PISTON TYPE – 4"x 18" Built to stand 2,000 PSI 12.75
A-5 VICKERS – 10" dia. Ball type. Built to stand 2000 P.S.I. 24.75

ELECTRIC ACTUATORS
Hundreds of uses for any mechanical device needing controlled 2 way action. Opens, closes, raises or lowers doors – windows – gates – valves.
CTU-2 – Foote Linear Actuator – 24 volt, DC, 8500 RPM, 1/6 HP – series wound motor. 4½" stroke in 13½ sec. Compression and tension loads up to 750 lbs. Adjustable micro switch for limits of travel. Overall lngth., retracted 11" 7.95
We also carry many more sizes and types of Actuators. Write today for information.

HYDRAULIC CYLINDERS
Gives 20,000 lb. thrust (push or pull) using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 3000 PSI. Can also be used on low pressure air systems. 4" bore; 18" stroke; 30½" length. Ideal for road farm – shop machinery. 29.75

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Double action. Bore is 1" – Shaft ½". Has stroke of 2½" to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 1100 lbs. 5.75
We stock over 50,000 Hydraulic Cylinders, Valves, Pumps, Accumulators, Hand Pumps, Motors, Hose, etc. All at Money Saving Prices.

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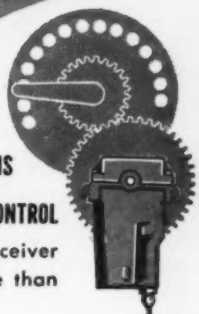
Sperry

Hydraulic REMOTE CONTROLS



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***For example*–RHEOSTAT CONTROL**

The geared take-off at the receiver shaft is used wherever more than 90° travel is required.

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SPERRY PRODUCTS, INC.
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REPRESENTATIVES IN PRINCIPAL CITIES

New "HIGH" in Pressure Recording

... up to 80,000 p.s.i.

Foxboro offers the most complete line of highly accurate pressure instruments available. Diaphragm, spiral and helical spring, and bellows-type elements of phosphor bronze, beryllium copper, steel or stainless steel, for a wide selection of ranges from 2" of water to 10,000 p.s.i. Also, a new heavy-duty helical spring of Type 316 Stainless Steel now provides accurate measurements in full or expanded ranges from 50 to 80,000 p.s.i. . . . even in pulsating service. Choice of round or rectangular cases. For specific information on your problem, write The Foxboro Company, 214 Norfolk Street, Foxboro, Mass., U.S.A.

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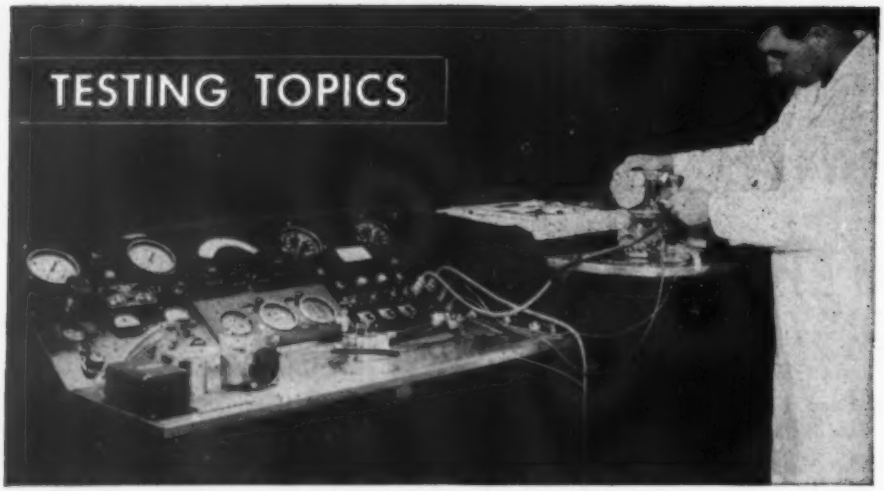

GREER PROPELLER GOVERNOR TEST STAND checks the mechanical "IQ" of the brains behind the performance of hydromatic constant speed propellers. This machine will test double acting, single or double capacity and reversible governors.

GREER HI-LO MAGNETO TEST STAND, above, tests both high and low tension magnetos, distributors, and coils of Pratt & Whitney and Wright Aircraft engines.

Testing the Flying Clippers

Pan American's Miami Overhaul Base Uses Greer Test Equipment

Accuracy! Dependability! Speed! These are the qualities Pan Am seeks in test equipment, and finds in Greer. Greer has simplified and standardized its line to the point where customers can order test equipment right out of the Greer catalog.

Please feel free to call on Greer to discuss any aircraft testing or maintenance problem. If your question is not within our scope, we will tell you where it can be answered. Call or write Greer today.

GREER AIRCRAFT STARTER TESTER is used for high capacity aircraft starters up to 1400 foot-pounds of torque. Accessories kit permits testing of actuators.

GREER
TEST EQUIPMENT

Greer Hydraulics Inc. 454 Eighteenth St., Brooklyn 15, N. Y.

Field Offices: 298 Commercial Bldg., Dayton • 2832 E. Grand Blvd., Detroit • Representatives in all principal cities

NEW PRODUCTS

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start. With the press moving, if either solenoid or either pilot valve reverses, pilot pressure will fall so low on both sides that both main valves will reverse and the press will stop. In normal operation both main valves operate simultaneously and reverse simultaneously.

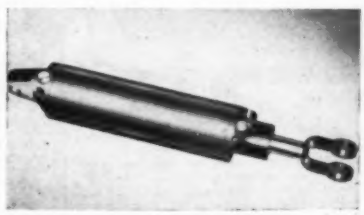
Application: Prevents repeats due to valve failure on mechanical presses controlled by air-operated clutches and brakes. Both valves must operate to start the press, if for any reason only one valve reverses; the unit fails safe and the press stops.

Hannifin Corporation
Chicago 6, Ill.

Circle 157 on Reader Service Card

PNEUMATIC CYLINDER

Design: Unitized cartridge rod bearing has been developed to both aid in servicing and reducing wear caused by misalignment. Included in the cartridge unit are a long bronze rod-end bearing, rod packing and a self centering packing at the pivot point. This cartridge can be replaced without disassembly of



the cylinder, simply by removing a snap ring, pulling out the unitized bearing and dropping in a new one.

Construction: Heavy wall tubing, chrome plated rods, rod scraper and milled wrench flats on rods are standard in all cylinders. The cylinder heads are locked in place in a counterbored section of the tubing wall at the ends of the cylinder.

Sizes: Available are 1½ through 8 inch bores with a stroke of any length up to 18 feet. All standard mounts are available.

Carter Controls, Inc.
Lansing, Ill.

Circle 158 on Reader Service Card

CENTRIFUGAL PUMPS

Designation: Model B
Sizes: 1 and 1 ¼ inch discharge, and will pump up to 70 gpm; heads up to 110 feet.
Construction: Pumps incorporate mechanical shaft seals, stain-

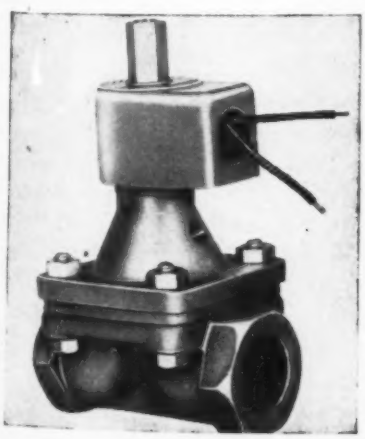
less steel shafts, enclosed bronze impellers and heavy duty ball bearings.
Applications: For general service or as integral parts of air conditioning units, cooling towers and hot water circulators.

Carver Pump Co.
Muscatine, Iowa

Circle 159 on Reader Service Card

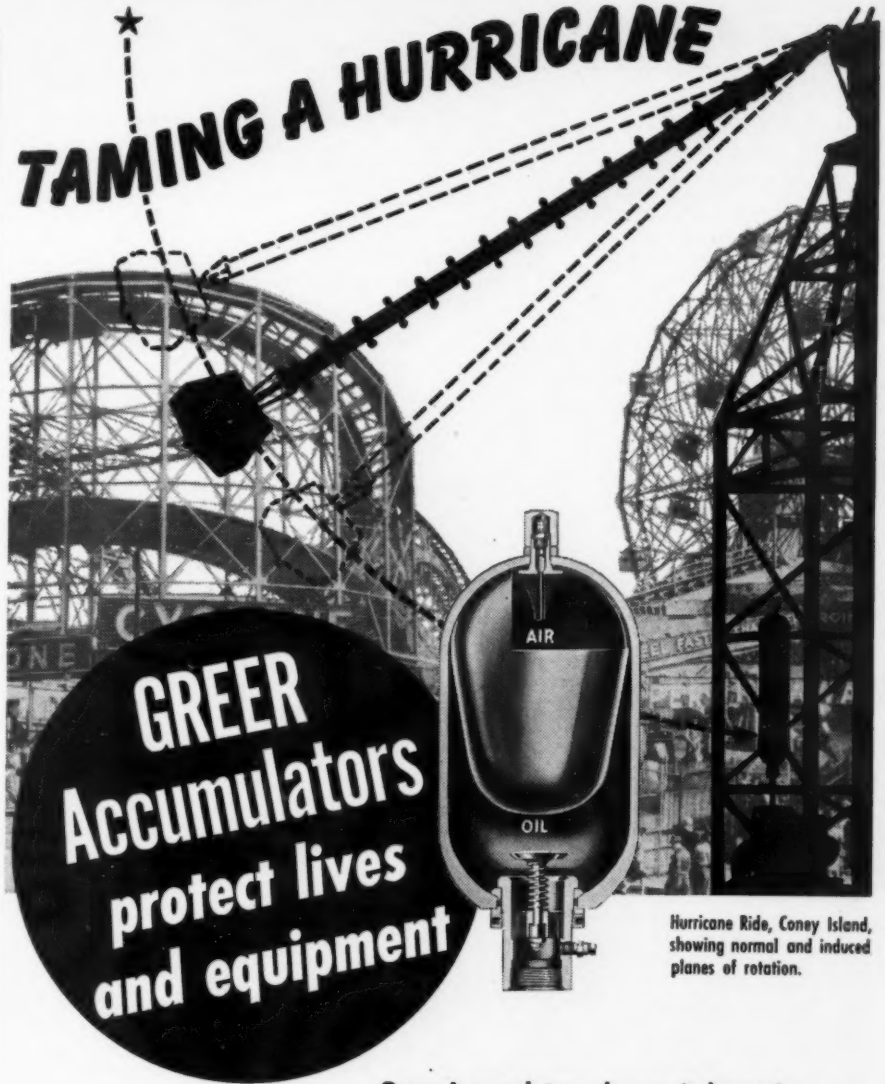
PILOT CONTROLLED VALVE

Design: Two moving operating parts: the flexible diaphragm and the solenoid core. Pressure, air or liquid, is introduced directly from the pilot and impressed upon the diaphragm to close the valve. Upon release of this imposed pressure the line pressure opens the valve.
Construction: Bodies are cast iron, bronze or stainless steel. A sanitary body as well as rub-



ber or glass linings are available.
Applications: For handling high-

TAMING A HURRICANE



Hurricane Ride, Coney Island, showing normal and induced planes of rotation.

GREER Accumulators protect lives and equipment

Greer Accumulators play a vital part in controlling the operation of the Hurricane Ride in Coney Island. After the cars attached to 30-ft. arms attain normal speed of rotation, an operator thrills the passengers by abruptly raising and lowering the cars above and below their normal plane of rotation by means of a 4-way valve. Should the hydraulic circuit fail, the accumulator would provide emergency power to prevent wreckage due to uncontrolled swing. Another accumulator is used to smooth out pressure fluctuations.

Let us show you how to assure safe, dependable, efficient operation of your equipment and also reduce the size, cost, and power requirements with Greer Accumulators. Write or phone.

Functions Performed by
GREER ACCUMULATORS

1. PRESSURE STORAGE CHAMBER to provide
   a. Main source of hydraulic power.
   b. Auxiliary power source.
   c. Emergency power source.
2. PRESSURE-VOLUME COMPENSATOR for
   a. Leakage compensation.
   b. Temperature compensation.
3. DISPENSER OF FLUIDS and Lubricants.
4. TRANSFER BARRIER for Fluids and Gases.
5. SHOCK ABSORBER to
   a. Absorb line shocks.
   b. Reduce pump pulsations.

SEND FOR BULLETIN

GREER ACCUMULATORS
U. S. PATENTS UNDER OLEAR LICENSES

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456 18th Street,
Brooklyn 15, N. Y.

Sales Representatives in Principal Cities
District Offices: 407 So. Dearborn St., Chicago 5 • 2832 E. Grand Blvd., Detroit 11
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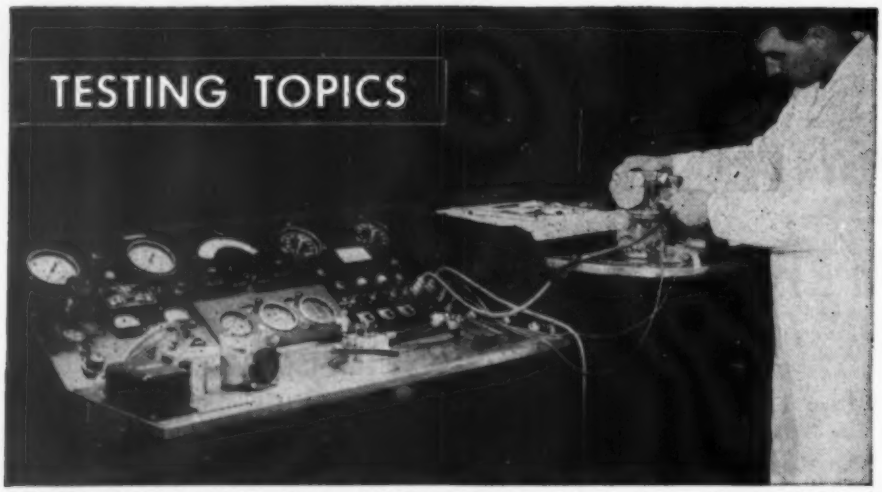

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Hannifin Corporation
Chicago 6, Ill.

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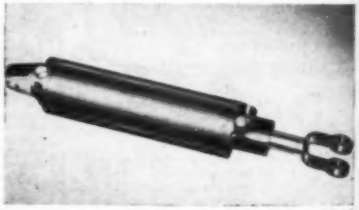

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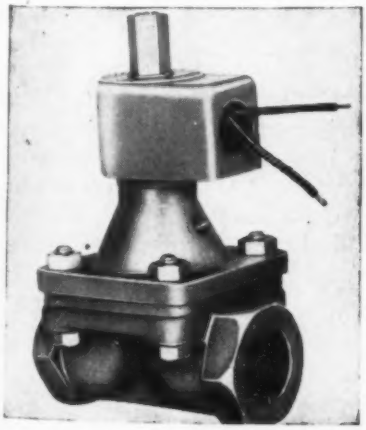

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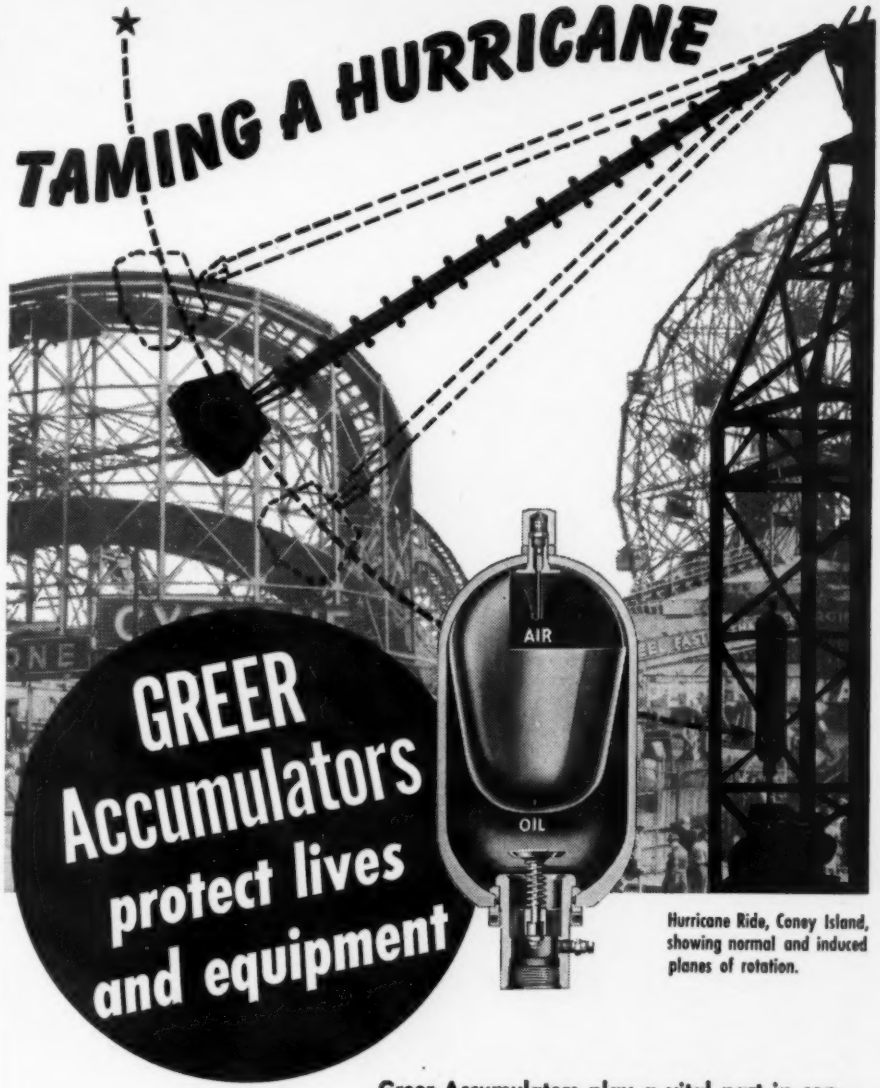

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ly corrosive liquids and gases, and food products.

Sizes: Pipe sizes range from ½ to 2 inches. Standard voltages are 115-230 AC, 50-60 cycles and 115 DC. Maximum temperature is 180 degrees F.

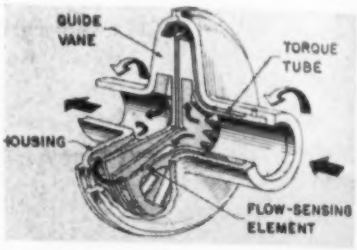
Automatic Switch Company
Orange, N. J.

Circle 160 on Reader Service Card

FLOWMETER

Application: Capable of measuring the true mass rate of flow of anything that will flow or fall through a pipe.

Features: This mass meter may materially add to airline safety. A small unit with an integrator will tell the pilot exactly how much fuel he has left since the measurement would not be effected by temperature of viscosity. For industrial use two or more units could be used with a proportioning unit to perfectly



control any mixture in an industrial process.

Operation: Measurement is made of the torque necessary to give the flowing mass a Coriolis acceleration. This torque is dependent only on the dimensions of the flowmeter, a rotational speed, and the mass flow so that all of the usual volumetric troubles are completely eliminated.

Control Engineering Corporation
Norwood, Mass.

Circle 161 on Reader Service Card

GROOVE GAGE

Designation. P gages

Features: Precision built for sturdiness, simplicity, and trou-

ble-free operation with a minimum of moving parts. All wearing parts of properly heat treated alloy and tool steels.

Applications: For faster, accurate measurement of small bores and internal grooves used to measure grooves for holding "O" rings.

Rimat Tool Company
Pasadena, Calif.

Circle 162 on Reader Service Card

SHAFT SEAL

Designation: Type 19

Features: Special beveled cones

SUPERIOR NON-AGING
Hydraulic Tubing . . .

100% Better Workability Than Ordinary Steel Tubing!

There's a reason, of course, why Superior's special, cold drawn, seamless hydraulic tubing is so much more ductile than common tubing . . . It is drawn from hollows made from aluminum-killed tube billets, under special melting practice. And carbon content is held to .12% maximum. (Did you realize that JIC Standards allow up to .18% maximum carbon content?)

***Result:*—NON-AGING tubing of exceptionally low yield strength and unusually high elongation. The relatively thin walls and smaller outside diameters make it easy to form long sweep bends and eliminate many fittings—or bend to close radii in cramped spaces.**

All Superior hydraulic tubing receives a 100% hydrostatic test before delivery and each order is tested for flareability. You may specify Superior tubing in any size from ⅛" to 1⅛" O.D. Our new folder gives sizes, wall thicknesses and recommended maximum working pressures. The coupon will bring you your copy.

Superior
THE BIG NAME IN SMALL TUBING

All analyses
.010" to ⅝" O.D.
Certain analyses
(.035" max. wall)
up to 1⅜" O.D.

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Firm.....
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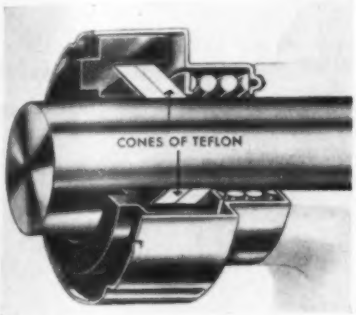
made of Teflon are utilized as the flexible member. This adapts the seal for services involving water, oil, corrosives or acids; temperatures from -100 degrees



to -450 degrees F. Being a packaged type unit, it provides quick and easy installation for production assembly and replacement service.

Sizes: To fit shaft diameters of ¼, ⅜, ½, ⅝ and ¾ inches.

Crane Packing Co.
Chicago, Ill.

Circle 163 on Reader Service Card

MIDGET CYLINDER

Designation: Micro Model.

Features: This model has a 1 inch stroke and is for use in small jigs and fixtures where size and space limitations are primary factors. Although small in size they deliver 75 pounds thrust on a 100 psi line pressure. Equal ram pressure is given at any stroke point.

Construction: Cylinders are machined from solid brass bar stock, eliminating the possibility of rusting, or pitting of cylinder walls.

Applications: For ejection or injection of work, for holding or

clamping of parts for welding, riveting, drilling, etc. or any other processing or assembling operation.

Air-Mite
Chicago, Ill.

Circle 164 on Reader Service Card

Manual or spring-return to neutral position are the two models by Valvair. Three types: (1) all ports blocked at neutral; (2) inlet and cylinder ports open to pressure, exhaust closed; (3) inlet closed, cylinder ports open to exhaust. 3-way and 4-way. Pipe sizes, 1/4" through 1". Six control assemblies: knob, lever, clevis, treadle, cylinder, solenoid.

4-way, piped exhaust, spring-centered neutral valve.

★ ★ ★

Get Bulletin "KA-4"

VALVAIR CORPORATION • *Affiliate: Sinclair-Collins Valve Co.*
951 Beardsley Ave., Akron 11, O.

REPRESENTATIVES IN PRINCIPAL CITIES

Rely upon **Valvair**

Would you rather drive

this...

or this...

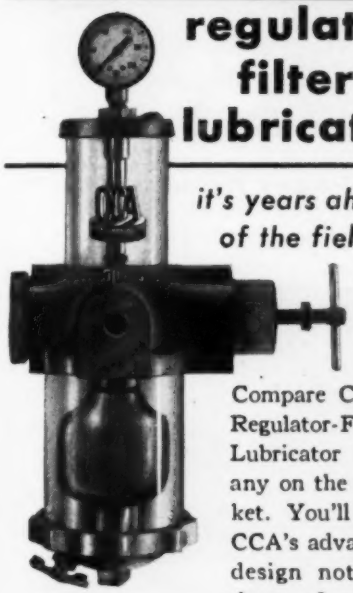
FOR YOUR PLANT
INSIST UPON THE

CCA

FOR COMPRESSED AIR

regulator
filter
lubricator

it's years ahead of the field!



Compare CCA's Regulator-Filter-Lubricator with any on the market. You'll find CCA's advanced design nothing short of astonishing! It's more compact—all in one unit—saves space. Installation involves just 2 pipe connections. (Remember—added connections mean added chance of leaks, added expense). It supplies metered lubrication automatically. Filter removes liquid water by centrifugal action. Unit provides piston type regulation —down to ¼ lb. WITH PRESSURE RELIEF FEATURE BUILT IN. CCA is your best buy . . . by far. Stocked in principal cities. Catalog on request.

CCA PRODUCTS DIVISION
BRECO MANUFACTURING CO.
309 E. SARATOGA ST. • BALTIMORE 2, MD.
Complete line of compressed air line equipment-including Filters, Lubricators, Regulators, DeHumidifiers

Circle 120 on Reader Service Card

Circle 24 on Reader Service Card

POST SCRIPTS OF INDUSTRY

News about people, manufacturers and sales organizations

H. Thomas Hollowell, Jr.
Standard Pressed Steel Co.

Roland V. Poisson
Chain Belt Company

Edward M. Rhodes
Chain Belt Company

H. Thomas Hallowell, Jr., president of **Standard Pressed Steel Co.,** Jenkintown, Pa., has been named to receive the 1952 Achievement Award of the National Metal Trades Association for an outstanding contribution in the field of industrial relations.

Chain Belt Company of Milwaukee made three personnel appointments effecting the operations of its **Baldwin-Duckworth Division. Edward M. Rhodes** was named assistant to the general manager, **Roland V. Poisson** has been appointed assistant sales manager and **William E. Kennedy, Jr.** has been named supervisor of Duckworth Automotive Timing Chain sales.

The **Cleco Division of the Reed Roller Bit Company,** Houston, Texas, has appointed the following companies as distributors. General Equipment and Machine Co., 511 East Colfax Avenue, South Bend, Indiana; A and I Supply Company, 614-616 Virginia Street West, Charleston, West Virginia; Lyons Machinery Company, 904 Broadway, Little Rock, Arkansas; and Equitable Equipment Co., Inc., 410 Clamp Street, New Orleans 12, Louisiana.

John F. Neff has been appointed division manager in Toledo and surrounding area for **Aro Equipment Corporation,** Bryan, Ohio. His headquarters are at 1010 Madison Avenue, Toledo.

Romulus Tool & Engineering is the name of a new company that will be owned and operated by **Joseph Player** as president and **Edward Halik,** both former employees of Turchan Follower Machine Co. The new company will build jigs, fixtures, controls and special machinery, complete from engineering to finished machine tool. Romulus Tool and Engineering is located at 36051 Goddard, Romulus, Michigan.

Appointment of two men to new posts in the Cleveland Valve Division of **The Parker Appliance Company** is announced by C. J. Giblin, division manager. **Walter C. Loeman,** who has headed the cost planning for the comptroller has been named production manager and **Robert C. Dyrenforth** will take the post of division engineer, with both product and process engineering responsibilities.

Hydraquip Corporation, 6645 Navigation Boulevard, Houston 11, Texas, has been named Franchise Agents for APPLIED HYDRAULICS magazine. Hydraquip Corporation are distributors of hydraulic and pneumatic components and packings.

Here's how this strainer "combs" itself clean!

This simple chalk test shows how AUTO-KLEAN's unique built-in comb construction cleans the strainer without costly interruption of flow

ORDINARY BLACKBOARD CHALK leaves heavy deposit of chalk particles on and between discs of Cuno AUTO-KLEAN strainer.

TURNING HANDLE ONE REVOLUTION moves strainer element through comb blades, removing all traces of chalk from between discs. Cuno's exclusive combing operation cleans *thoroughly* —without stopping flow.

FILTERING AREA IS COMPLETELY CLEAN, restoring full initial capacity. All chalk particles and dirt fall to bottom of housing where they can be drained periodically.

- AUTO-KLEAN's permanent metal filter element is available in steel, brass, or stainless steel for long, trouble-free service.
- AUTO-KLEAN is adaptable to any fluid-flow system.
- From acids to tar . . . if you can pump it, Cuno can filter it. Capacities range from one gallon per hour to 15,000 gallons per minute.

CUNO

ENGINEERED FILTRATION

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

SINGLE-STRAINER FLUID PROTECTION FOR HYDRAULIC SYSTEMS

Continuously cleanable AUTO-KLEAN eliminates need for stand-by strainers

AUTO-KLEAN's compact construction gives users positive solids-from-fluid separation in space which would limit ordinary filters to by-pass service. The low pressure drop operation of AUTO-KLEAN strainers enables you to have full-flow service on gravity, low pressure, high pressure or suction lines—with no loss in operating efficiency.

Cuno's exclusive "comb-clean" action provides *complete* cleaning of the filter element—without stopping fluid flow. Thus, there's no need for a stand-by strainer.

The low maintenance costs of AUTO-KLEAN save you money, for there are no cartridges to change. An occasional rotation of the handle does the cleaning job (most units can be equipped with motor-drives for continuous cleaning).

Fixed-space metal discs in this modern strainer effectively remove all solids larger than the specified disc spacing—from .0035" up to .062".

For permanent, positive hydraulic system protection, install compact Cuno AUTO-KLEAN—the precision-built strainer. Send the coupon for bulletin.

A.3.5

Cuno Engineering Corporation
Dept. 355-A South Vine Street, Meriden, Conn.

Please send me free bulletin on Cuno AUTO-KLEAN.

Name.....

Company.....

Address.....

City.....Zone....State.....

BIG MONEY
on
BABBITT
by using
PROMET XXX
LONG SERVICE
LEAD BASE
BABBITT

A fine, velvety grain babbitt made entirely from pure virgin metals, perfectly alloyed and heat treated to withstand tremendous loads at high speeds and elevated temperatures that would be dangerous with other babbitts.

Tensile 10,000
Elong 5.5%
Compress Strength 10,000

Promet XXX will not score, cut or powder even in lubrication failures. The coefficient of friction is considerably less than that of tin babbitts, thus reducing power loss and wear. The entire bearing surface wears uniformly, without pitting.

Simply heat to 900°-1000° F. and pour. Can be heated to 2000° F. without burning or injury. Repouring only refines it. There is no appreciable shrinkage, hence a better contact with supporting shell, a more solid, rigid bearing.

Ideal for use in blowers, cement mills, clay working machines, compressors, conveyors, crushing machinery, diesel engines, dredges, fans, machine tools, mining machinery, motors and generators, paper mills, pumps, rock and gravel plants, saws, steel mill bearings and sugar mills.

Supplied in 10 lb. pigs.
IMMEDIATE DELIVERY

Write today for service data sheets and quotations.

THE AMERICAN CRUCIBLE PRODUCTS COMPANY
1303 Oberlin Avenue
Lorain, Ohio, U.S.A.

Post Scripts of Industry

Continued

Negotiations for the purchase of a 12-acre factory site located between Detroit and Lansing, Michigan, by the **Reuland Electric Company,** Alhambra, California, have just been completed. Construction of office and factory buildings are scheduled to start early in the spring of 1953. The company's Eastern operations will be headed by **A. G. Fournier,** who upon completion of the new facilities will transfer his headquarters to the East.

The **Standard Pressed Steel Co.,** Jenkintown, Pennsylvania, has opened a warehouse in the Los Angeles suburban area of El Segundo, to service 11 states and British Columbia in the company's Pacific Coast sales territory. The warehouse located at 815 North Sepulveda Blvd. will permit improved delivery schedules.

H. C. Allington was elected vice president in charge of sales of the Eastern Division of the **Colorado Fuel and Iron Corporation.** Allington's headquarters will be in New York City.

The **Hammel-Dahl Company** of Providence, R.I., opened two California offices. Both offices will be devoted to sales and service, and will be under the supervision of **Thomas H. Ponton.** Ponton had previous experience in the West Coast area while associated with E. I. duPont Company. The Los Angeles office is at 3715 Santa Fe Avenue and in San Francisco, 607 Market Street.

Devon W. Fryback has been named sales manager of the Eastern region for the Industrial Division of **Minneapolis-Honeywell Regulator Company,** Philadelphia. Also announced was the appointment of **O. B. Pyle, Jr.** as industrial manager of the Mid-Atlantic area and **Edward J. Klein** as industrial manager for the Philadelphia branch office.

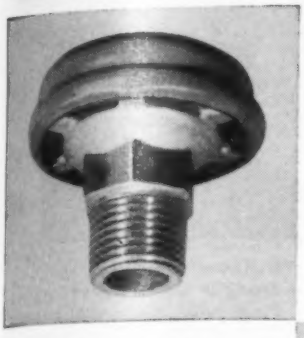
William S. Renier
The Renier Co., Inc.

The **Renier Company, Inc.,** newly incorporated firm of engineers and designers, has established offices at 5209 Euclid Avenue, Cleveland. The firm will undertake the complete design of machine tools, hydraulic presses and equipment, and specialized machinery of all types. The company is headed by **William S. Renier,** president, who for the past two years has been director of engineering of the Hydraulic Press Manufacturing Co. **H. F. Fisher** of Fisher and Associates has been elected vice president and **L. W. Sahley,** president of Euclid Tool Engineering Co., is secretary-treasurer.

Chain Belt Company of Milwaukee appointed four new sales engineers to their district sales office organizations. **William C. Beals** joins the Buffalo district sales office. **Robert B. Hill** has been assigned to the Portland, Oregon sales office. **James W. Mueller** will be working in the Chicago office and **Dabney P. Murrill** has been assigned to the Atlanta office.

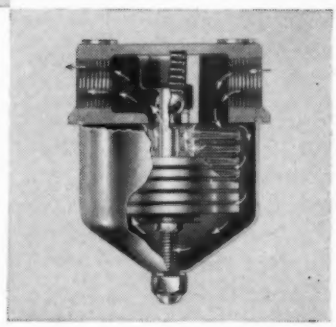
Circle 7 on Reader Service Card

Two AIR-MAZING ways to keep dirt out of your hydraulic systems



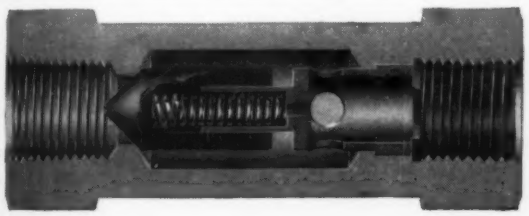
1 AIR-MAZE BREATHER FILTERS for hydraulic system vents keep out airborne dust and dirt. Oil-wetted wire baffles trap the dust, also act as efficient backfire flame and spark arrester. All metal, cleanable, vibration-proof filter media. Wide range of types and sizes.

2 AIR-MAZE LIQUID FILTERS are permanent, all-metal, cleanable. Many times more effective filtering area than in conventional cylindrical filter cartridges. Special screen media available in various mesh sizes. Capacities range from 1.7 gpm to 720 gpm.



FREE BOOKLETS! Write today for copies of new booklets on Air-Maze liquid filters and Air-Maze breather filters.

AIR-MAZE CORPORATION
25001 Miles Rd. • Cleveland 28, Ohio



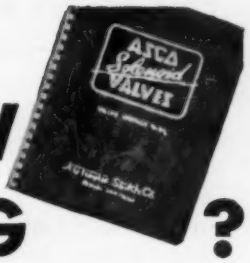
CHECK VALVES

- **ONE PIECE CONSTRUCTION**
  No welds or brazes to crack or fail—
  Available in ⅜", ½", ¾", 1" NPT line sizes
- **NYLON POPPET**
  Assures leak proof trouble-free service
- **LIGHT WEIGHT**
  Aluminum body and nylon poppet reduce overall weight and increase ease of handling during installation
- **LOW PRESSURE DROP**
  Minimum pressure loss thru valve at rated flow

Write for illustrated circular A

WATERMAN ENGINEERING Company
725 CUSTER AVENUE
EVANSTON, ILLINOIS

WANT THIS NEW CATALOG?



NEW ASCO CATALOG

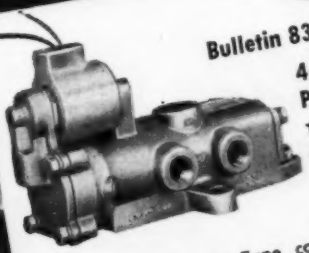
Describes Scores of Solenoid Valves

New Valve Catalog No. 24 brings you up-to-date on the extensive ASCO line of Solenoid Valves (list prices are included). New valves developed and put on the market recently are described in detail *for the first time*. A few of these are:

Bulletins 8262 and 8314
Midget Size
2 & 3-Way Packless Solenoid Valves

Midget Valves are now available with EXPLOSION-PROOF Solenoids for Class 1, Group D hazardous locations.

2-Way (Normally Open or Normally Closed) — Ports, 1/16" through 3/16"; pressures up to 1000 p.s.i. 3-Way — Ports, 3/64" and 3/32"; pressures up to 125 p.s.i. Time Delay Feature — Valves with 3½-6½ seconds delay also available.



Bulletin 8344
4-Way POPPET TYPE Packless Solenoid Valves

This valve has been thoroughly tested as a control unit in equipment requiring "plus" performance. Valve features:

Reliability — Poppet Type construction means this valve will not stick! Power stroke occurs in both directions — no spring return!

Fast Operation — 500 cycles/minute continuous duty; 750 cycles/minute intermittent duty (air).

Freedom in Mounting — Can be mounted in any position. Available 4 and 5 port; flow metering; standard or manifold mounting; ⅜, ½, ¾, and 1 inch pipe size. Handles air, water, or hydraulic oil; maximum pressure 250 p.s.i.

These two are just examples of new valve data. If you have *any* need for controlling the flow of liquids or gases in the equipment you are designing or operating, you should find this up-to-date ASCO Valve Catalog useful. Want a copy? Just drop us a note or call up and let us know. We'll be glad to send it to you . . . and extras for your associates if you desire.

ASCO Solenoid VALVES

We manufacture a complete line of Electromagnetic Controls including Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and complete Control Panels.

Automatic Switch Co. V. 53.1

385 H LAKESIDE AVENUE • ORANGE, NEW JERSEY

Circle 123 on Reader Service Card
Circle 16 on Reader Service Card

Continued

Matthew J. Betley and **George Fischer** were elected as vice presidents of **Aeroquip Corporation.** Betley is works manager and Fischer is general sales manager of the company. Both men joined the Aeroquip management in September 1952.

Four new members have been appointed to the board of directors of **Air Associates, Inc.,** Teterboro, New Jersey. **H. R. Baxter,** new chairman of the board, **J. E. Ashman,** recently elected president and director of the corporation, **W. H. Foulk** and **A. R. McKay.**

H. J. Howerth, Jr. has been named assistant sales manager of the Wayne division of **Gar Wood Industries, Inc.**

J. A. Robinson has been made field sales manager for the Industrial Division of **Minneapolis-Honeywell Regulator Company,** Philadelphia. Robinson succeeds **O. B. Wilson** who was recently appointed sales manager of industrial instruments. He will supervise all industrial field sales and service personnel for all Industrial Division products.

H. G. Taylor, president of **Precision Rubber Products Corporation,** announced the establishment of a wholly owned Canadian subsidiary, **Precision Rubber Products (Canada) Ltd.** It is located at Ste. Therese, de Blainville, Quebec, 18 miles from Montreal. The new plant has 14,000 square feet of floor space and will start production in April, 1953.

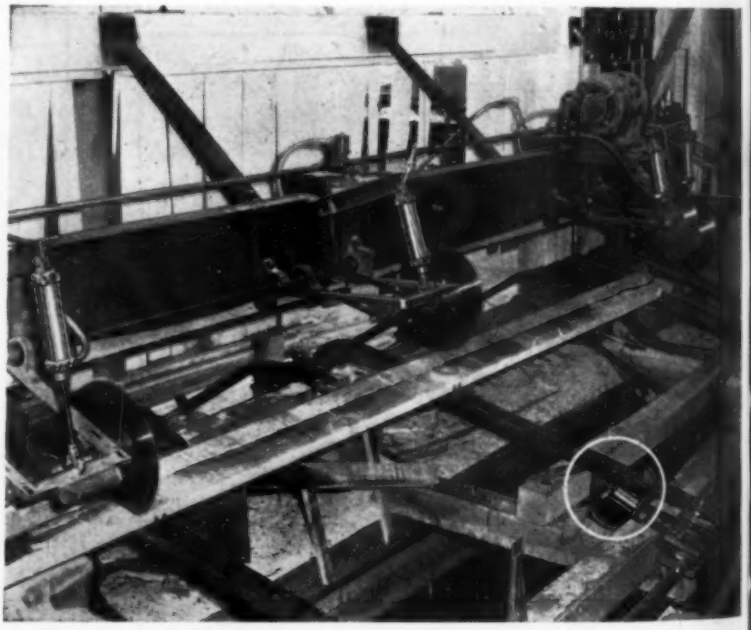
Matthew J. Betley
Aeroquip Corporation

George J. Fischer
Aeroquip Corporation

Air Feed for TRIM SAWS..with NOPAK Air Cylinders

This 8-saw trimmer installation at Lumber Mills Corp., Ashland, Ore., utilizes NOPAK Model "E" cushioned Air Cylinders to "feed" the saws to the work. As the Link-Belt conveyor chains carry the lumber toward the trim saws, only the two saws which cut the boards to commercial lengths with minimum waste are lowered by the NOPAK Cylinders. The cylinders may be actuated by manually operated or automatic valves.

NOPAK Cylinder, located under conveyor chain, powers flipper arms which transfer boards from preceding conveyor chains at lower right.



Photograph, courtesy of Link-Belt Co., shows NOPAK Model "E" Cylinders used in conjunction with Link-Belt conveyor chains and pillow blocks.

This is one of many lumber mill installations employing NOPAK Cylinders to move saws into cutting position. (Others are shown in the NOPAK Application Manual.) It may suggest similar uses for NOPAK Cylinders and NOPAK Valves in your plant, or in machinery you build for resale.

For Data and Dimensions refer to Sweet's File for Product Designers, or write for Bulletin SW-1.

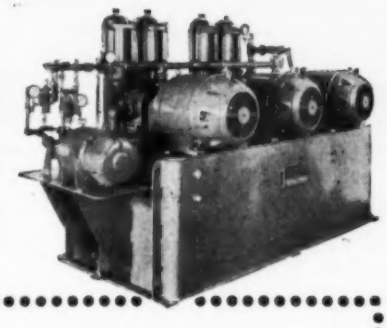
NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

GALLAND-HENNING MFG. CO.
2743 SOUTH 31ST STREET • MILWAUKEE 46, WISCONSIN
Representatives in Principal Cities

A 7367-½H

Circle 52 on Reader Service Card

HIGH CAPACITY HYDRAULIC POWER UNIT



The unit illustrated furnishes hydraulic power for payoff and tension reels in the country's most up-to-date steel plant processing lines. Unit has sufficient capacity for handling 60,000 pound coils at the specified high line speeds, with automatic pressure holding and pump unloading devices.

Two of the main pumps are used for operation, the third is for standby service. The small auxiliary pump and accompanying valves furnish hydraulic power and control for maintaining strip edge register during payoff cycle.

Brief specifications show that reservoir capacity is 600 gallons, pump capacity 3-60GPM, Accumulator capacity 4-10 gallon Hydro-Pneumatic. Control of Accumulator circuit and unloading of pumps during idle cycle is by means of pressure switch and solenoid controlled relief valves at each pump.

Your inquiries for custom designed and standard power units will receive immediate attention.

Standard reservoirs in capacities 40, 60, 80, 100, 200, 300, 400, and 600 gallons.

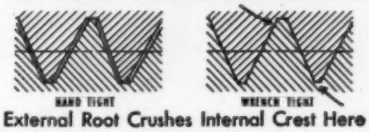
"HYPECO"
HYDRAULIC POWER EQUIPMENT CO.
Custom & Standard Hydraulic Power Units
Box 431 NORTH LIMA, OHIO Phone 9-3717
(Youngstown Suburb)

Circle 106 on Reader Service Card

UNBRAKO®
dryseal-thread
PRESSURE PLUGS

HOW THEY WORK

Internal Root Crushes External Crest Here



External Root Crushes Internal Crest Here

In tightening of UNBRAKO Pressure Plugs, the roots of the flattened threads actually crush the sharper crests of the mating parts. Major and minor diameters are positively sealed, pressure tight without compound. Stocked and sold by leading industrial distributors everywhere. Write for literature. SPS, Jenkintown 2, Pennsylvania.

Our Fiftieth Year : A START FOR THE FUTURE
UNBRAKO SOCKET SCREW DIVISION
SPS
JENKINTOWN PENNSYLVANIA

Depend on **DARCOID** *O-RINGS— for guaranteed performance!*

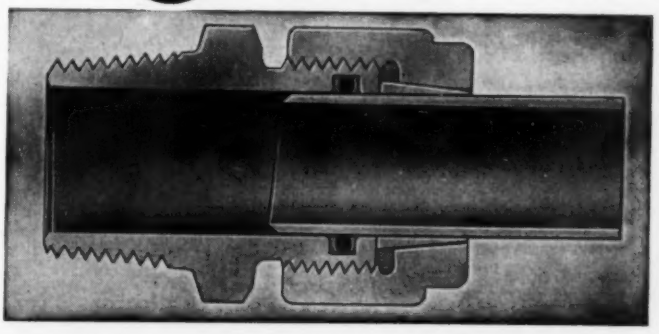
Walter Kidde & Company, Inc., Belleville, N. J., industry-leaders in CO_2 fire fighting equipment, uses Darcoid O-Rings in trigger finger control mechanism where dependable sealing is a MUST.

Take advantage of Darcoid's complete O-Ring service facilities — immediate delivery from complete stocks!

• Write or phone for design and installation data and comprehensive O-Ring Catalog.

THE DARCOID COMPANY
Incorporated
Authorized Distributor for The Goshen Rubber Company on all Specification Molded Parts
145a Sixth Avenue • New York City • Phone ALgonquin 5-1393

LENZ "O-RING" TUBE COUPLINGS



Eliminate Flaring . . . Threading Welding . . . Soldering

- Seal and grip are separate
- No metal to metal seal
- No exact tube length necessary
- Not necessary to cut tube square
- No concentration of stresses due to flares or ferrules for tube failures.
- Fast Installation — No tools required but a wrench.

For complete details & Specifications write for bulletin AH 101

LENZ COMPANY
Box 1044-A • Dayton 1, Ohio • Melrose 2557 • Michigan 7985

Post Scripts of Industry

Continued

Frank R. Adams
The Bellows Co.

The appointment of **Frank R. Adams** as field engineer in the Saginaw, Michigan territory by **The Bellows Co.**, was announced. His headquarters will be at The Bellows Co., 702 Second National Building, Saginaw, Michigan.

To provide industry with engineering, production and research services in the fields of filtration and porous media, the **Micro Metallic Corporation, Aircraft Porous Media, Inc.**, and the **Porous Plastic Filter Company** have affiliated as the **Pall Filtration Companies** under the leadership of **Dr. David B. Pall.** The new organization is located in Glen Cove, N.Y.

Air Hydraulic Products Co., manufacturers of special hydraulic equipment, has moved to 11470 Kaltz, Centerline, Michigan.

Reorganization of the **Buckeye Brass and Manufacturing Co.**, Cleveland, Ohio, was announced. **Don F. Shook** succeeds Otto G. Gundel as president. **Leon Disinger** who has been associated with the company for 25 years will continue as vice president and general plant manager. **Alan S. Dale** was appointed vice-president and general sales manager.

Kilbourne Knox, Jr., for the past five years senior designer on hydraulic equipment with the McDonnell Aircraft Corporation, St. Louis, has joined the **Parker Appliance Company** as staff engineer in charge of engineering on the company's program on aircraft hydraulic equipment. For the present, his assignment will involve work both in Cleveland and at the subsidiary Parker Aircraft Company plant in Los Angeles. Knox's early experience was as a project engineer and preliminary designer with Spartan Aircraft Corporation in Tulsa and with Curtis-Wright Corporation in Buffalo. This was followed by six years as vice president and chief engineer of the Globe Aircraft Corporation in Ft. Worth, Texas, prior to joining McDonnell Aircraft in 1948.

Standard sizes range from 1/16" to 1½".

Write for folder AP

ALLEN Tru-Round PIPE PLUGS

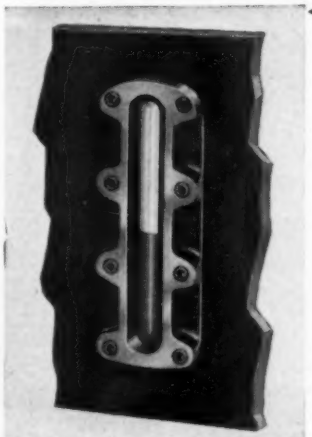
- Burr-free threads
- Full Pressur-forming
- Tru round — uniform taper
- Available in Dryseal and Standard threads

Allen® Dryseal Pipe Plugs used with N.P.T.F. threading will withstand up to 3000 lbs. pressure without leaking, making them particularly valuable for refrigeration, hydraulic and similar equipment. Allen® Standard Pipe Plugs for use with A.N.P.T. threading provide a perfect seal without sealing compounds at ordinary pressures.

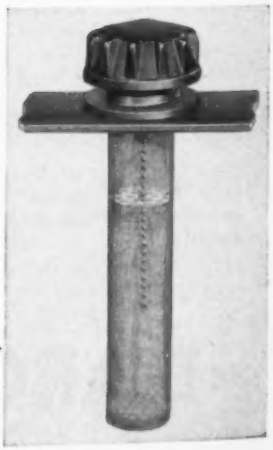
SOLD ONLY THROUGH LEADING INDUSTRIAL DISTRIBUTORS

THE ALLEN MANUFACTURING COMPANY
Hartford 2, Connecticut, U. S. A.

Demand the best...use CENTURY accessories!



←For new or modernization of old reservoirs use CENTURY designed and built Sight Oil Level Gages.



Get the best. Use CENTURY designed Filler-breather Cap assemblies for all your reservoirs. →

CENTURY HYDRAULICS, INC.
19135 JAMES COUZENS HIGHWAY • DETROIT 35, MICHIGAN

The **Turchan Follower Machine Company,** Detroit, announced the promotions of **Gale S. Humes**, general manager; **Otto C. Turchan,** sales manager; and **Demeter Kiurski,** chief engineer.

Carl H. Drenske will represent the **Republic Manufacturing Company** of Cleveland, covering the states of California, Washington, and Oregon. He is direct factory representative, and will work with distributors and contact original equipment manufacturers. Mr. Drenske joins Republic after 15 years with Parker Appliance Company, Los Angeles. His headquarters are located at 15139 Valario Street, Van Nuys, California.

The Armature & Electric Machine Company, with offices at 1708-10 Jackson Street, Omaha, and 1485 Keosauqua Way, Des Moines, is the new sales agent and distributor for **The Reliance Electric & Engineering Company** in these cities.

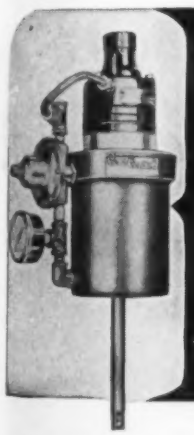
Paul E. Kelly has been named vice president of **Superior Tube Company,** Norristown, Pa. Kelly, who continues as treasurer, joined the company in 1936. **Charles E. Pugh** was named secretary, in addition to his duties as assistant treasurer and comptroller. **James C. Turner** was appointed assistant secretary and assistant treasurer.

Dean W. Paul has been appointed sales manager of the **Electro Dynamic Division** of General Dynamics Corporation in Bayonne, N. J. Paul will make his headquarters at the renovated and expanded Electro Dynamic Plant.

Linear Incorporated, of Philadelphia, has appointed the **Burr Oak Belting Company** as its distributor for the Cincinnati, Ohio, area. The company is under the management of J. M. Pennington.

Paul E. Kelly
Superior Tube Co.

Dean W. Paul
General Dynamics Corporation



Up to 5 times faster response with
NEW CONOFLOW PNEUMATIC CYLINDER MOTORS for
THROTTLING CONTROL

The New B-50 Series of pneumatic cylinders for throttling control service operate on air pressures up to 100 psig and are capable of repositioning accuracies of 1/500 part of total stem travel. Simplified one-piece piston construction features graphite impregnated "O" ring seals and a piston positioner integrally mounted in the head plate. Extra sensitive, speedy and stable—because of minimum friction and precisioned aluminum design.

Many applications include positioning electrical components, variable speed drives, rubber pinch valves, etc. Available in 4", 6" and 8" diameters with 3" and 4" stem travels. Furnished complete with cushion-loading regulator and gauge, fully piped, ready for installation.

Write for bulletin B-50-AH.

CONOFLOW CORPORATION
2100 Arch St., Phila. 3, Pa.

NEW SKINNER SOLENOID VALVE
EXPLOSION PROOF TYPE X5

THE new Skinner X5 Solenoid Valve is basically the same as the widely accepted and tested V5, but modified to a construction that is Underwriters' approved for Class I, Group D hazardous locations. Small size and lightweight features are retained, and the X5 is low in price because of the many parts which are interchangeable with other Skinner valves. Rating is 10 watts max.; soft, spring loaded seals prevent leakage; internal parts are stainless steel; wide variety of port locations in ⅛" and ¼" size; most types available for metering; for AC or DC in a wide range of voltages and frequencies; can be mounted in any position; supplied as two-way normally open or closed, three-way normally open, closed or directional flow. *Write today for details!*

SKINNER ELECTRIC VALVE DIV.
THE SKINNER CHUCK COMPANY
105 Edgewood Ave., New Britain, Conn.

Post Scripts of Industry

Continued

Black, Sivalls & Bryson, Inc., Kansas City, has announced the appointment of **Chester A. Siver** as general manager of engineering. Siver will have company-wide supervision of engineering activities, including engineering staffs in Kansas City, Oklahoma City and Tulsa. He will headquarter at the Kansas City general offices and will be assisted by **W. W. Pyeatt,** administrative assistant; **C. W. Hayes,** chief engineer, Oklahoma City; **Harold Manual,** chief engineer, Kansas City; and **Al Hanssen,** chief engineer, Tulsa.

The Lang Company, steel fabricators and equipment suppliers located in Salt Lake City, Utah, has been appointed exclusive industrial sales representative for **Chiksan Company** in the states of Utah and Idaho.

Gerald E. McEvoy has been named director, vice president and treasurer of **Pacific Tube Company,** Los Angeles, California, manufacturers of steel tubing and representatives for **Superior Tube Company.** He was formerly treasurer and assistant secretary of Pacific Tube Company.

Dale D. Drollinger, attached to Reliance's Cincinnati sales application engineering staff since last April, becomes branch manager at Rockford, Ill. **Daniel J. Donnelly,** in the Philadelphia office for nearly two years, takes over Drollinger's post in Cincinnati, **John M. Duff** joins the sales application engineering staff at Boston and **George P. Loomis, Jr.** takes on sales application engineering duties in Syracuse.

Lindberg Opens New Plant

Last month, Lindberg Engineering Company, Chicago, Illinois, opened its new west coast plant at 11937 South Regentview Ave., Downey, California.

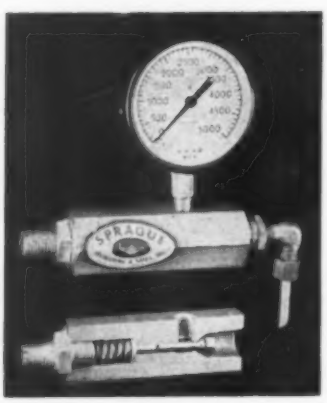
This new factory comprises 12,000 sq. ft. of production and office space and is used to manufacture industrial heat treating furnaces and other Lindberg products used in aircraft and other vital west coast industries.

The new facilities were built to provide better servicing operations and to speed deliveries. It also offers FOB Los Angeles prices on the complete line of products.

Materials Handling Show

All available display space at the National Materials Exposition, which will be held at Convention Hall, Philadelphia, May 18 to 22, has been reserved by a total of 284 companies who will exhibit. All six halls of the huge auditorium will be filled with the largest industrial capital goods exposition ever held in Philadelphia.

PROTECT YOUR GAGES!



New Shut Off Valve automatically cuts out gage from system when hydraulic or pneumatic pressure goes beyond its operating limit. Automatically opens when pressure is again within operating range of gage. (Cut-in point approx. 80% of set cut-out point.) Available for low pressures—30, 60, 100, 200 and 300 PSI. and high pressures—500, 1000, 1500, 2000, 2500, 3000 and 5000 PSI. Sprague Gage Shut Offs installed in a hydraulic system with multiple gages of various ranges, save valuable man hours. They eliminate the necessity of the operator opening and closing manually operated shut off valves for the various gages in the system. Supplied with standard pipe thread connections but can also be furnished with AN adaptors for aircraft fittings. Connection to the system is made at the end of shut off, ½" pipe thread. Connection to gage is made on the side of shut off, ¼" pipe thread. Overall length 5½ inches. Body is 1½ inch hexagon stock. Other models with bronze or stainless steel bodies available for water service. Finest construction. Individually tested and fully guaranteed. When ordering, specify capacities desired. Write today for bulletin.

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Designers and Manufacturers of Precision Aircraft and Industrial Test Equipment.

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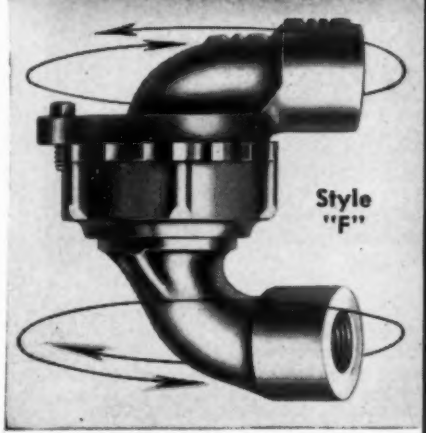
for pipe lines that *move!*



For unrestricted flow of steam, air, or fluids through moving pipe lines or to equipment in motion.

Complete 360° swing. The strength of pipe with the flexibility of hose. Only four parts assure long wear, low maintenance. No springs, small or loose parts. Four styles in standard pipe size, ¼" to 3".

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Heavy-duty Model 1065 shown. ⅓ to 2 HP, 3.8 to 21 CFM, 10 to 30 PSI. Direct or V-belt.

Light-duty Model 0440 shown. ¼ to ⅓ HP, 2 to 5.6 CFM, 7 to 20 PSI. Direct or V-belt.

Integral Motor – Pump Model 0210, ¼ HP, 1.3 CFM, to 25 PSI.

V-belt Dual Chamber 10 x 1040. 9 CFM each side, vac. to 20", pres. to 20 lbs.

better appearance . . . performance

→FOR YOUR PRODUCTS with GAST AIR COMPRESSORS

Offer your customers better performance, better appearance! Specify Gast rotary-vane Air Compressors as original equipment where compressed air of 10 to 30 lbs. is needed. Select from 1.3 to 24 CFM range – numerous combinations. Precison built; integral-motor, V-belt or direct drive models; standard accessories.

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Parallel Application

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- **Fully Balanced—Self Centering—Built-in Adjustable Relief Valve.**
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Center sections are available making additional Controls in this Multi-unit.

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With leakproof

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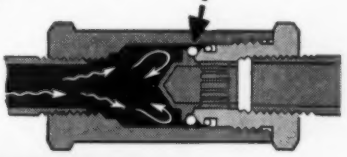
The ultimate answer to check valve requirements from very low pressure to 3,000 psi.



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- Foundry Jogging Machines
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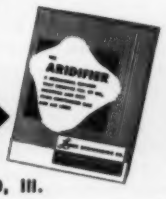


Logan ENGINEERING CO.

4920 W. Lawrence Ave., Chicago 30, Ill.

Pioneer Changes Name

Pioneer Pump Mfg. Company has changed the name of their company to Pioneer Hydraulics, Inc., according to an announcement by W. J. Rawitzer of the company. The Pioneer Hydraulics, Inc., organization make the well known line of Pioneer quick, self-sealing couplers for industrial and agricultural applications; they discontinued the manufacture of pumps some years ago. There is no change in the company management, personnel or location.

Skinner Opens New Plant

RECENTLY, THE Skinner Chuck Company completed a new, modern plant at Edgewood Avenue, New Britain, Connecticut. This new building provides complete facilities for The Skinner Chuck Company, and Skinner Electric Valve Division. It comprises 85,000 square feet of floor space, with every modern facility for the production of lathe chucks and machine vises for machine tools and solenoid operated valves.

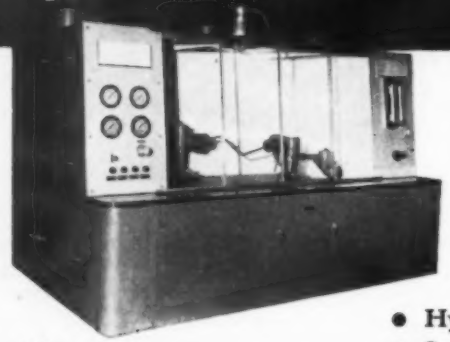
All general offices and engineering departments for both divisions of the company are housed in the front of the building. Other facilities in the plant include experimental and development laboratory.

Worthington Distributors Convene

The Worthington Corporation held their Fifth Refresher Course and Sales Conference on Wednesday, Thursday and Friday, February 25, 26 and 27 at the Harrison, N. J. headquarters. Over forty industrial distributor key men attended the series of lectures on product engineering and applications.

The group, in charge of J. C. Glenn, Manager of Worthington's Merchandising Division, heard Frank J. Whelan, Vice President, on policy discussions; E. A. Murray, Manager, Compressor Division, on air compressors and controls; and Igor J. Karassik, Manager of the Multi-stage Pump Section, Centrifugal Pump Division.

SPECIAL AIR AND HYDRAULIC EQUIPMENT



Write us about your special fluid power requirements

On this stand:
Four intensifiers giving four pressure selection ranges from 50 to 10,000 psi are powered by an explosion-proof compressed air or electric system. Careful system design which prevents leakage permits using water, light oils or Varsol, a low viscosity cleaning agent in the pressure system.

- Hydrostatic Test Equipment
- Special Intensifiers to 20,000 P.S.I.
- Portable Hydraulic Drive Units
- Air-Hydraulic Boosters
- Aircraft and Industrial Test Facilities

Air Hydraulic Products Co.

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THE MARKET PLACE

SALES ENGINEERS
Oil-Hydraulic

HYDRECO, manufacturer of oil-hydraulic control equipment is expanding sales organization and has several openings for sales engineers experienced in oil-hydraulic field. Would be located at branch offices being established in eastern and mid-western industrial areas. Qualified engineers seeking permanent positions in sales engineering are invited to send in qualifications and compensation requirements to Hydreco a Div. of The New York Air Brake Co., 1100 E. 222nd St., Cleveland 17, Ohio.

FOR SALE:

Vickers Hydraulic Power Units, V-2008 Variable Delivery Pumps, V-2305 Two Stage Pumps, Mounted on 60 gallon Tanks with 10 hp Louis Allis Motors, Electrical Controls and Filters. Also Test Equipment, 5 hp Dynamometers, etc. Write for Details. Box 41, Kensington Station, Detroit 24, Michigan.

HAND HYDRAULIC PUMP

Single and Double Designs To 20,000 P. S. I.

- **Dual Pump Unit Reservoir. 360 cu. in.**
- **Interchangeable Pistons**
- **Interchangeable Pistons 3/8-1/2-3/4 inch**

Pressure range is 3,000 to 20,000 P.S.I. Pipe connections 1/4" N.P.T. Handle length is 18 inches. Weight is 8 to 18 pounds. Unit can be bolted or welded into position. "We specialize in hand pump units to operate in temperatures from minus 65 F to plus 160 F and with any capacity reservoirs required."

WILLIAM S. PINE
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Solve Sludge Problem with Nicholson's

New AIR TRAPS

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1) No air-wasting vent, such as is in all inverted bucket traps.
2) Positive water seal of valve.
3) Large orifice keeps valve clean, preventing blow-through.

Three types; pressures to 1500 lbs. For details send for

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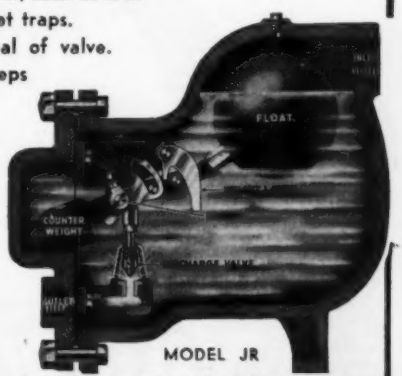

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213 Oregon St., Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

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The Higher the Pressure ...the Tighter the Valve

On hydraulic presses of all types this Yarway Hydraulic Valve will give long life with minimum maintenance. Automatically regrinds its own sealing surfaces. Small and compact. Easy to install and operate.

Yarway Single-Pressure Hydraulic Valves are made in straightway, three-way and four-way types; in five sizes for pressures up to 5000 lbs. Also Yarway Two-Pressure Valves in two sizes for pressures up to 5000 lbs. Write for Bulletin H-210.

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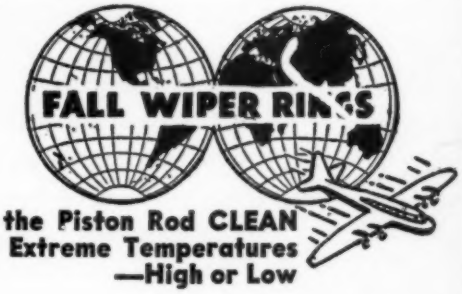
Improved Type
HYDRAULIC VALVE



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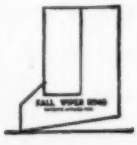
We make sizes AN6231A1-½" to AN6231A71-13"



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Covered by Patents Issued and Patents Pending.

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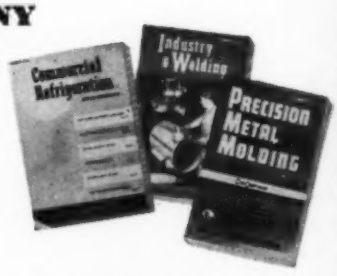

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